

Abstract

Education learning package has been in the market and in the web for a long time. Most of the web pages however are specific for primary school student children and kids and for other computer learning. For the example, "Ujian Pendidikan Sekolah Rendah" (UPSR) for the primary school student. None of the learning package or web page available in the software market is developed for the Physics subject in the SPM examination.

INTELLIGENT TUTORING SYSTEM WEB PACKAGE

by

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Abstract

Education learning package has been in the market and in the web for a long time. Most of the web pages however are specific for primary school student children and kids and for other computer learning. For the example, “Ujian Penilaian Sekolah Rendah” (UPSR) for Bahasa Melayu subject is one of the learning web pages for the primary school student. None of the learning package or web page available in the software market is developed for the Physics subject in the SPM examination.

Furthermore, most of the learning web page do not have an attractive user interface and do not provide any important elements regarding on examination like SPM.

Intelligent Tutoring System(ITS), for SPM Physics is thus proposed to overcome these shortcomings. ITS is an Internet-based learning system. This system has covers four main syllabus or topics out of seven topics of SPM Physics paper. The system provides short notes, tutorial part, experiments part and a modal exam paper to prepare the student for the SPM Physics examination. Compare to other learning web page, ITS provides an attractive user interface element that includes images (in graphics or animation way), this making the learning of the way are more efficient method for this subject. And also, experiment applications are also provided to let students conduct the Physics experiments by monitoring them how to conduct the experiment with voice capability. This is one of the system intelligent specifications. This voice would construct the student to perform the experiment steps correctly. For each topic, the system provided a tutoring module for user or student has comprehended them regarding on those topic. After they finished every topic, the student will enter into exam module where they will sit this exam similar to their SPM exam.

Final result will be displayed after they complete answering the entire exam question.

This is briefly about this learning system.

In order to develop a comprehensive system, related information is gathered from books, Internet surfing and other learning materials. After conducting a thorough analysis, the SDLC (System Development Life Cycle) strategy or methodology was selected to develop this project. Internet is chosen to be the platform for the development of this project because the user or student can easily access this system any time and very easy and also freely available. Macromedia Authorware Attain 5 is selected as the main system development tools and also other programming tools like Java Script and HTML will be added to develop this system.

It is hope that the development of ITS will assist the upper level secondary school students to achieve a better result in the SPM examination especially on Physics subject.

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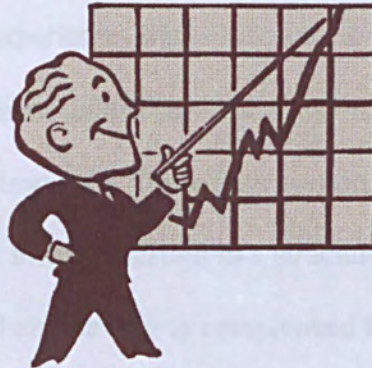
1.1 Introduction

An Intelligent Tutoring system (ITS) for SP4 Physics is a multimodal education package based on SP4 curriculum. This system covers four main topics out of

CHAPTER 1

PROJECT

OVERVIEW



The notes section will be a comprehensive list of topics that he or she has studied. The worksheet will be a set of questions that they can use to check their understanding.

During this time, students will be able to create their own projects. The system will be able to help them with their projects.

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ITS provides an interactive environment that can help students learn and understand the concepts of physics.

The system will be able to help them with their projects. The system will be able to help them with their projects.

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Chap1: Project Overview

1.1 Introduction

An Intelligent Tutoring System (ITS) for SPM Physics is a multimedia education package based on SPM examination level. This system covers four main topics out of seven topics. User or student can study this subject at his or her own pace using this system. The design of the system is using an attractive and east-to-use interface. The Physics brief notes are provided to help the users to well understand the theory, concept or phenomena of Physics. The system also including of interesting graphics and animation images, voice or sound and others to describe the Physics reactions. Also the experiment applications on each topic are provided with voice instruction that to let the users conduct the experiment with using the system. The interactive experiments will help the users to perform the experiment step with correctly. Besides that, the system also included tutorial and exam module. These will ready to prepare the SPM students to the real SPM examination environment. These both sections are contained a lot of challenging Physics questions, format question like structure and objective.

The notes section will help the user to comprehend the topics that he or she has revising. The tutorial module will help the user to refresh their memory after complete learning each topic. Experiment module provided for conduct the experiment work. The exam module is design similar to SPM Physics exam. When compare to the textbook, ITS provides an attractive user interface that are includes multimedia tools that making the learning process more efficient. The main tools that are used to develop this system are Authorware, Java Script, HTML and also other multimedia packages.

This Internet-based learning tool is going to be combination of these tools as well as an interactive multimedia product.

1.2 Project Objective

The objective of the project is to build a system that can benefit user especially those at upper secondary school level and also who will sit for the SPM Physics examination. The project will develop a high quality courseware for the use in today's upper secondary school, private educational institutions and also for the home market. The term "high quality" here refers to the courseware effectiveness in deriving the appropriate information and it is ability to capture the user interest in process of learning. The project is also aiming to make computer as learning tool, conforming to the concepts of smart school in Malaysia's education system. The project will explore several of techniques in multimedia teaching - learning environment via computer. Techniques are includes like hypertext, audio, graphics and so on. These will bring the learning process more attractive and efficient.

This online learning system (ITS) will enable students to

- Know, understand and use Physics models, law, principles, concept and theories.
- Understand, interpret and make use of scientific information posed in various styles.
- Solve problems in various situations.
- Analyze, synthesize, evaluate and think about ideas and information logically and critically.
- Knowing to handle the techniques and various aspects of scientific equipment safety.

- Instill proper values and attitudes in the learning and practice of science.

1.3 Project Scope

ITS is focuses on developing a window-based application by Internet access that can be used not only by all the SPM Physics students but can also used by other students whom sit for the STMP examination and universities students including. The system has been covered four main topics, which are:

- Kinematics and Dynamic
- Mass Property and Energy
- Electromagnet
- Electronic

The main language will use in this project is Bahasa Melayu as the subject is taught in that language in school. Students can use this system to prepare themselves for SPM Physics examination. The system can also use for teaching tool for school teachers or lectures in colleges or universities. Since most of the users of the system are students, the designs of the systems are not to complicate. The ease of the use and clarity is the main concern.

Overall, there are six main modules in this system.

1.3.1 Login Module

This module is about the system that will ask user is name and student number for an authentication system.

1.3.2 Learning Module

This module is about the system that provides a small Physics notes on particular topic.

So, the user or student will learn and memorize it.

1.3.3 Tutorial Module

This module has provides all the exercises for particular topic. There have several structure questions for each topic. Student are required to answer all the questions and after that they mark will be displayed. The system will advise them if they obtain a lower mark else otherwise. Here also provided answer in voice-instruction method that will explain how to solve the particular Physics problems.

1.3.4 Experiment Module

In every topic, the system will provide an experiment work. It emphasis mainly on Physics SPM experiments. When the students enter on this module, the screen will display the diagram of experiment tools. The system also will provide a voice-based instruction (similar to Tutorial Module), where the system will explain how to construct the experiment work.

1.3.5 Examination Module

In this module, the student will sit for the online examination that similar to SPM Physics examination. There have two parts, one is 20 objective questions and another part is several subjective questions. Total time for answering all the questions is about 1 hours and 15 minutes. Time remaining will be display while they was answering the exam question. After finished all the questions, the system will display the final result. If they got mark 50 and above, they qualifier as pass on the examination otherwise consider fail.

1.3.6 Exercise Module

In this module, the system will evaluate the student in four main components in Physics, which are understanding of concepts, analyzing of experiment work, calculation of Physics problems and Memorizing of Physics formula. The system will advise them which of those components are very poor by student.

1.4 Project Development Methodology

The System Development Life Cycle (SDLC) strategy was selected for the development of this project. SDLC will enable the project to be developed rapidly by prototyping approach. This strategy is adopted to become of various reasons as explained below.

- A multimedia ITS online learning courseware has a relatively small amount of background processing and this system tend to emphasize on the user interface and data flow within the program. Thus prototyping approach would best suit the development of such system.
- Prototyping provides a tangible system to work with instead of abstract specifications that may be feedback before too much time and effort is wasted on screen design and concepts that will not work successfully.
- Iteration is an integral feature of the prototyping approach. Through iteration, the development stages of design, implementation and evaluation are performing not just once, but as many times as necessary in the given time frame for development. This increases the likelihood that the final product will be of high quality.

1.5 Project Schedule

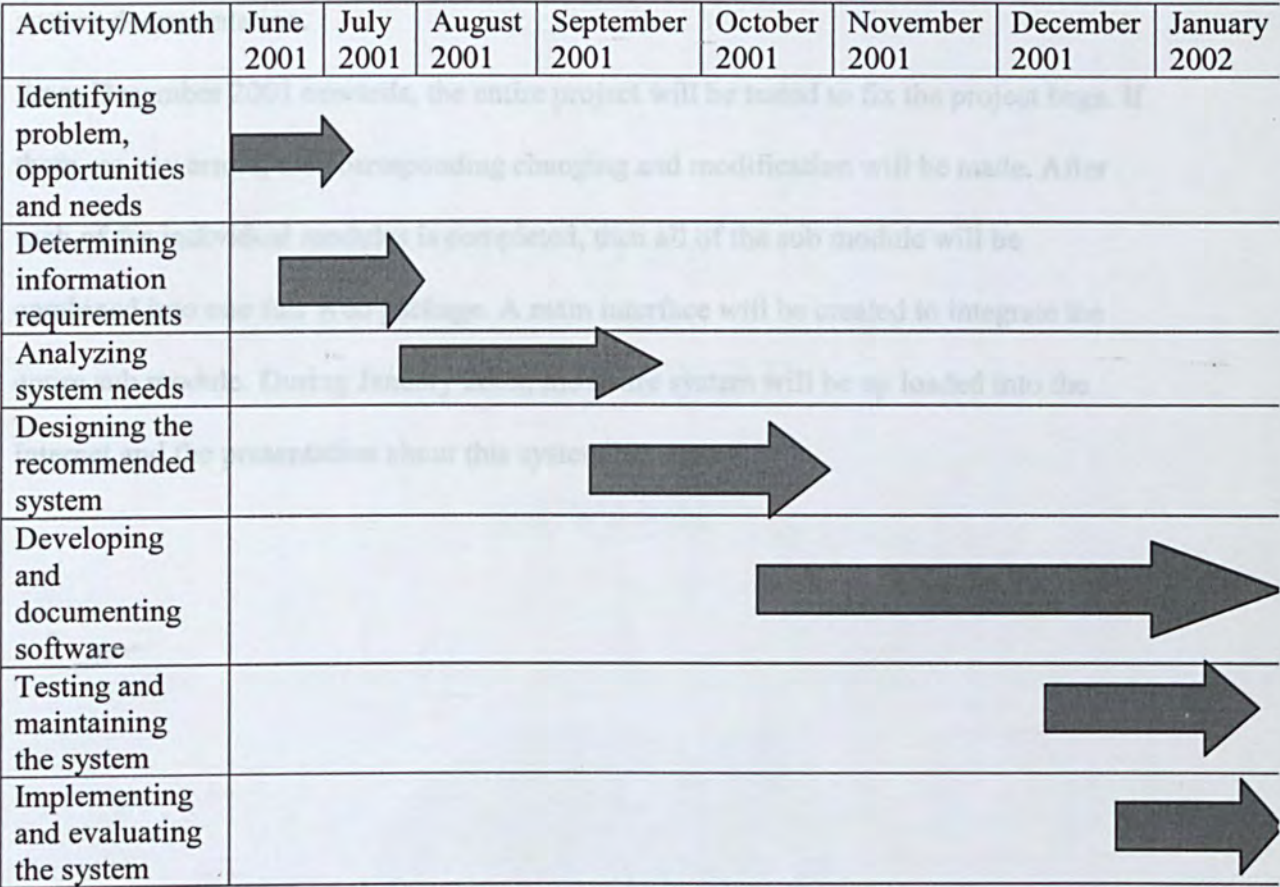


Figure 1.1 Gantt chart of the system

The project was carried out through the period from beginning of June 2001 until the end of January 2002.

From July 2001 to August 2001, the syllabus of SPM Physics was identified. Review work also has been done on previously year’s report that done by senior students for reference.

During September 2001, studies on the system development tools which is available in the market and tried to select the suitable authoring tool that have suggested suite for the system. Before that, work on review takes place on features and done comparison between the authoring tools.

From October 2001 onward, the system has been developed and also started to write the system documentation.

From December 2001 onwards, the entire project will be tested to fix the project bugs. If there are any errors, the corresponding changing and modification will be made. After each of the individual modules is completed, then all of the sub module will be combined into one full Web package. A main interface will be created to integrate the entire sub module. During January 2002, the entire system will be up loaded into the Internet and the presentation about this system has done it.

REVIEW



Chapter 2: Literature Review

2.1 The Education System in Malaysia

According to the Malaysian Education System, there are three levels of education: school education of primary, secondary, post-secondary and tertiary education.

CHAPTER 2

LITERATURE

REVIEW



Chapter 2: Literature Review

2.1 The Education System in Malaysia

According to the Malaysian Education System, there are three levels of education, which consists of primary, secondary, post-secondary and tertiary education. The duration of primary education is six years, five years for secondary education, one and half year for post-secondary education and three or more than three years for the students to complete their tertiary education. At present, the Ministry of Education has implemented four public examinations at four different stages and these examinations are acting as a prerequisite for students to further their studies. The four main examinations are UPSR (Ujian Penilaian Sekolah Rendah), PMR (Penilaian Menengah Rendah), formally known as SRP, SPM (Sijil Penilaian Malaysia) dan STPM (Sijil Tinggi Penilaian Malaysia).

2.1.1 UPSR

Involve the Standard Six pupils in primary school. The examination will evaluate the student's knowledge and skills learned in Standard One to Six.

2.1.2 PMR

Involve Form Three student in secondary school. The examination will evaluate the student's knowledge and skills learned in Form One to Three.

2.1.3 SPM

Involve Form Five student in secondary higher school. The examination will evaluate the student's knowledge and skills learned in Form Four and Five.

2.1.4 STPM

Involve Form 6 students in secondary school. The examination will evaluate the student's knowledge and skills learned in Lower Six and Upper Six.

2.2 Physics SPM

What is Physics? Physics is the scientific study of matter and energy and the effect that they have on each other. Physics is one of the compulsory elective subjects in the SPM examination for the science stream students. The learning of Physics are include:

- Understanding the theory, concept or phenomena of Physics.
- Memorize the rule, law, principle and equation of Physics.
- Mathematical skills
- Technique to answer questions and experimenting Physics theory.

2.2.1 Format of SPM Physics

In the SPM examination, Physics paper is one of the elective subjects in-group IV and has examination code 4530. The SPM Physics examination consists of three papers; there are Paper 1, Paper 2 and Paper 3. For the paper 1 examination, one hour and 15 minutes is provided to students to finish their exam. The paper consists of 40 subjective questions that cover all the Form 4 and Form 5 Physics syllabuses. Each questions has four selection (A, B, C and D) and students are required to select one of the selections. For the Paper 2 examination, there are subjective and essay type of questions that provided to students within two and half hours. In subjective type questions, about five to seven questions provided and required to answer all of them while choose two for four of essay questions.

For the Paper 3 examination, the students are exposed to real experiments works and accomplish their synthesis work within two hours.

2.2.2 Syllabus of the SPM Physics Paper

The syllabus of SPM Physics paper is divided to main seven chapters and four chapters are selected to build for this system. There are:

2.2.2.1 Kinematics and Dynamics

Kinematics is that branch of physics, which involves the description of motion, without examining the forces, which produce the motion. Dynamics, on the other hand, involves an examination of both a description of motion and the forces, which produce it. An understanding of kinematics and dynamics is essential in physics. One-dimensional kinematics involves motion in a straight line. This is the simplest case. The direction an object can move is limited. Vector quantities are introduced. Distinctions between vectors and scalars need to be made.

2.2.2.2 States of Matter and Energy

Properties describe matter. A block of wood, milk, and air all have properties. All the material on earth is in three states-solid, liquid, and gas. The "state" of the matter refers to the group of matter with the same properties. In other words, you group the objects together according to their properties.

2.2.2.3 Electromagnet and Electronic

Describing about the concept of electromagnet and electronic.

2.3 Multimedia

Multimedia is the integration or combination of the five basic media elements which are text, graphics, animation, sound and video, into an audio-visual application or presentation to convey a clear message to an audience. These elements constitute the building blocks of a multimedia application. See table below.

M	TEXT
U	
L	
T	
I	
M	GRAPHICS
E	
D	
I	
A	
	ANIMATION
	SOUND
	VIDEO

Table 2.1 The five basic multimedia elements

The more elements one uses, particularly audio and video, the more complex computer and processing power and storage space one needs. Similarly, the more complex the application becomes, the larger will be the multimedia files. The development of an interactive application involves using a lot of different media files, which represent the various media elements.

These media files are obtained from various sources and software packages. Some of these media file formats are cross-platform compatible and some are only readable on one platform. Regardless of the platform issues, all these elements are combined and sequenced in the final application, creating the multi-sensory environment conducive to learning and training. Although not exhaustive, these file formats serve different purpose and are products of different packages. Most of these formats are readable in many authoring and presentation packages to see which types of media file formats are supported.

Table 2.7 The two different file types which imported into an authoring package

2.3.1 Text

Text forms the basic layer on all multimedia applications. Without text, the information that needs to be conveyed may be lost in the interpretation of the rest of the media elements such as graphics, sound and video. With many different cultural norms to adhere to, using text is probably the safest way to convey the message. In creating a multimedia application or presentation, text is most often typed using the text tools provided with the presentation and authoring packages. However, in some packages like Macromedia Authorware and Director, text documents can be imported directly and edited into the final application. There are many different formats for text and that is dependent on the word processing document used. For example, using the Write program in Windows will produce a file format *.wri and using WordPerfect would result in a *.wpd file. For many authoring and presentation packages, these file formats are not readable. Table below has shown a list of the file formats that are importable into popular authoring packages like Macromedia Authorware and Director.

Types of file	Extensions
Rich Text Format. Available as a Save As functions in many popular word processing documents. This is a character-formatting file that makes it easier to share files between applications and via the Internet. With RTF files, all the formatting we do with the text style (bold, italics, underlines), justification (left, right, center or full) and fonts (sizes and types) are retained. In other words, when imported into another application, these RTF files look the same as when they were created in the word processing documents.	.rtf
ASCII (American Standard Code for Information Interchange) Text Format. This type of text was developed to standardize text on all computers. With this type of text file, any formatting that we create will be lost in the save. Text files are usually saved as unformatted text and is available as a Save As option on all word processing documents and is a native file format in the Windows Notepad program.	.txt

Table 2.2 The two different file types when imported into an authoring package

2.3.2 Graphics

Graphics and still images are integral to a multimedia application as they enhance the impact of the overall message. Text cannot be used alone and can be greatly augmented by the use of graphics and still images. Of all the media elements, graphics and still images contain the most diverse file formats. Many, if not all, of them are importable and readable by authoring and software packages. Table below has lists the popular file types for graphics and still images that can be imported into popular authoring packages like Macromedia Authorware and Director and presentation packages like Astound and QMedia.

Type of File	Extensions
A Bitmap file. This is found on the Windows platform. Available in software packages like Windows Paintbrush and all images editing packages like Adobe Photoshop and Fractal Design Painter.	*.bmp
A Window Paintbrush file format. Available to every Windows 3.1 or better user.	*.pcx
A PICTure file. This is a Macintosh file format that is cross-platform compatible with packages like Macromedia Authorware and Director.	*.pct
A Tagged Image File Format (TIFF) . This file format was designed to be	*.tif

portable between the Macintosh and the Personal Computer. There are many different versions of TIFF, which can be incompatible with each other. Available as a Save As function on many popular graphics and imaging packages.	
Computer Graphics Metafile (CGM) files. Created by the American National Standards Institute (ANSI) to be a universal, application-independent vector graphics file format. Can be created in packages like CorelDraw! and Aldus Persuasion.	*.cgm
Encapsulate PostScript files. Used mainly in desktop publishing because it offers the best imaging for vector graphics and typography and can be created in packages like CorelDraw!, Adobe Illustrator and Macromedia FreeHand.	*.eps
Graphics Interchange File Format. Pronounced as “geef”, it is a CompuServe Information Service format used by many software programs to create compressed bitmapped images. Images are saved as 8-bit graphics files and are smaller in size. Ideal file format for sending images through the Internet.	*.gif
PhotoCD images. Developed by Eastman Kodak, these PhotoCD images are up to 24-bit color. Quality of bitmapped images is high and contains photographic images. Ideal for converting photographs into digital format or for acquiring textures and backgrounds.	*.pcd

Table 2.3 Show popular graphics and still image file format

2.3.3 Animations

Animations are a series of graphics images that are sequenced together to create motion in an application. With animation files, we have a choice either to create two-dimensional animations or three-dimensional animations, i.e., 2D or 3D animations.

Table 2.4 has shows the various types of animation files that can be created. Creating animations is dependent on the software package that is used. Pure 3D packages like Autodesk 3D Studio and RayDream Designer allow us to save files as digital movie format (*.mov or *.avi). We may also create individual 2D images in popular graphics packages and save them as BMP or TIF and import them into macromedia Director to be sequenced as an animation.

Type of File	Extension
FLC/FLI files. Sometimes referred to as “flick and fly” files. Denotes animations files created in animation packages like Autodesk 3D Studio. Contains a sequence of images that make up a moving object or event.	*.flc/*.fli
Macromedia Director movies. Director has a built-in animation engine that lets us create 2D images or import them in various graphics formats(BMP, TIF, GIF or JPG) and sequence them to form an animated sequence. Macromedia Authorware supports director movies.	*.dir
QuickTime movies. It is a technology available on the Personal Computer and Macintosh platforms and allows animations to be saved as a digital video format.	*.mov
Video for Windows movies. This digital video format is only available to the Windows platform.	*.avi
Animated GIF . A series of GIF files are saved as one GIF file and embedded into a Web page to provide motion.	*.gif

Table 2.4 Show popular 2D and 3D animation file formats

2.3.4 Sound

Sound is probably the most crucial part of a multimedia application. Without sound, the presentation is lifeless, regardless of the various visual elements on the screen. The type of sound that can be used in a multimedia application is categorized by whether it is created as a wave file or composed using an electronic instrument. Table 2.5 has lists popular multimedia authoring and presentation packages.

Type of file	Extension
Wave file. This format is used for sound that is recorded into the computer. This includes narration and sound effects and background music. The music shows up as waves in the sound-editing program. Primarily used on the Windows platform.	*.wav
Audio Interchange File Format (AIFF) . This format is used on the Macintosh platform but is able to be imported into the Windows platform through authoring tools like Director and Authorware. Used for cross-platform audio. The sound also is in a waveform.	*.aif
Musical Interface Digital Instruments (MIDI) . This format entails creating customized music using electronic instruments interfacing with the computer. Sound is created and edited in a similar fashion as regular music composition. However, some musical background is required.	*.mid

Table 2.5 Shown popular audio file format

2.3.5 Digital Video

Using digital video clips in a multimedia application adds depth and pizzazz to the overall presentation. Digital video can consist of animations, 2D and 3D, or as clips captured from an analogue source such as a videotape or a video camera. Table below has lists the popular file types used for digital video.

Types of File	Extension
Video for Windows. Developed by Microsoft, this format stands for Audio/Video Interleaves file. Available only on the Personal Computer.	*.avi
Quicktime for Windows. Developed by Apple, this format allows Quicktime videos that have been captured and created on the Macintosh to be played on the Windows platform. Used for cross-platform development and supported by Director and Authorware.	*.mov
MPEG video. Stands for Motion Picture Expert group. It was developed to provide higher video compression ratio for digital video clips. MPEG files are usually smaller than .avi or .mov video clips. MPEG can be played both on the Macintosh and Windows platforms if the appropriate video drivers are there.	*.mpg

Table 2.6 Shown popular video file formats

2.4 Authoring and Convention Programming

An authoring system is a program which has pre-programmed elements for the development of interactive multimedia software titles. Authoring system very widely in orientation, capabilities and learning curve. Furthermore, authoring is actually just a speeded-up form of programming. Users do not need to know the introduction of a programming language or worse, an API but users do need to understand how the program work.

2.4.1 Authoring Methodology

There are few methodology used by authoring tools such as:

- Scripting language
- Iconic / Flow control
- Frame
- Card / scripting
- Cast / score / scripting
- Hierarchical object
- Hypermedia linkage

2.4.1.1 Scripting language

The scripting paradigm is the authoring method closest in form to traditional programming. The paradigm is that of programming language, which specifies (by filename) multimedia elements, sequencing, hotspots, synchronization, etc. a powerful object-oriented scripting language is usually the centerpiece of such a program; in-program editing of elements (still graphics, video, audio, etc), tends to be minimal or non-existent. Scripting languages do vary, check out how much the language is object-based or object-oriented. The scripting paradigm tends to be longer in development time (it takes longer to code an individual interaction) but generally more powerful interactivity is possible. Since most scripting languages are interpreted, instead of compiled, the runtime speed gains over the other authoring methods are minimal.

The media handling can vary widely, check out the system with our contributing package formats carefully.

2.4.1.2 Iconic/ Flow Control

The card or scripting paradigm provides a great deal power (via the incorporated scripting language) but suffers from the index-card structure. It is excellently suited for Hypertext applications and supremely suited for navigation intensive applications. Such programs are easily extensible via XCMD and DDL. They are widely used for shareware applications. The best application allow all objects (including individual graphics elements) to be scripted, many entertainment applications are prototyped in a card or scripting system prior to compiled-language coding.

2.4.1.3 Cast/ Score/ Scripting

This paradigm uses a music score as its primary authoring metaphor; the synchronous elements are shown in various horizontal “tracks” with simultaneity shown via the vertical columns. The true power of this metaphor lies in the ability to script the behaviors of each of the cast members. The most popular member of this paradigm is Director, which is used in the creation of many commercial applications. These programs are best suited for animation-intensive or synchronized media application; they are easily extensible to handle other function (such as hypertext) via XOBJs, XCMDs and DDLs.

2.4.1.4 Hierarchical Object

The hierarchical object paradigm uses an object metaphor (like OOP), which is visually represented by embedded objects and iconic properties. Although the learning curve is non-trivial, the visual representation of objects can make very complicated constructions possible.

2.4.1.5 Hypermedia Linkage

The hypermedia linkage paradigm is similar to the frame paradigm in that it shows conceptual links between elements, however it lacks the frame paradigm's visual linkage metaphor.

2.4.1.6 Tagging Paradigm

The tagging paradigm uses tags in text files (for instances SGLM/ HTML, VRML, 3DML, Win Help) to link pages, provide interactivity and integrate multimedia elements.

- Instructional tools are developer-tool-made-simple. These no-programming-required tools are ideal for the subject matter expert but they lack some of the power and flexibility of the more difficult to master tools.
- Delivery tools are not really authoring tools at all, but "containers". They really are class management tools. They organize content into classroom like formats: class rosters, threaded discussions, class scheduling, registration, class notes, student records, grading and all manner of administrative details. Typically, the content is created and organized externally and imported.

2.4.2 Multimedia Authoring Tools

Multimedia authoring software enables designers and developers to create interactive multimedia system without the need to possess fluent programming skills. In the simplest of definitions multimedia tools can be described as integrating together media segments by media resource programs. This has resulted in multimedia no longer being the domain of the purely professional developer as it has now become feasible to create system in the home or schools as examples. At present software companies provide a wide array of software, which range significantly in the terms of available features and working environment provided for creation. Web-based authoring tools seem to fall roughly into three categories:

- Developer tools are typically multimedia tools-turned web-production gadgets with some tacked on administrative capabilities. The learning curve is fairly steep for non-technical types as serious programming or scripting is required to best utilize these tools.
- Instructor tools are developer-tools-made-simple. These no-programming-required tools are ideal for the subject matter expert but they lack some of the power and flexibility of the more difficult to master tools.
- Delivery tools are not really authoring tools at all, but “containers”. They really are class management tools. They organize content into classroom like formats chat rooms, threaded discussions, class scheduling, registration, class rosters, student records, grading and all manner of administrative details. Typically, the content is created and organized externally and imported.

2.4.2.1 Authoring Tool Environment

Authoring tool environment can be classified as being one of following types:

- Card-based system. The author creates sets of cards (each card is effectively a screen of the application). The cards are store within a stack to form the complete application. To make the card interactive, they are linked to other cards by simple scripting written on buttons. The approach allows for simple and flexible designs but has disadvantage that it would require considerable programming to create a substantial system. Example card based application would be HyperCard and ToolBook.
- Icon-based system. A system build using this approach it is not necessary to do any significant programming, instead the emphasis is on constructing logical flow-charts with 'icons' (that have associated functions) describing interaction structures and incorporated media. A good example of an icon based authoring tool is Macromedia Authorware. The package contains a comprehensive library of icons and design features which includes almost thousands graphics objects (buttons and slides etc). It also includes 75 templates that can be used to integrate media elements to create an entire multimedia application.
- Time-based system. Within this approach the author synchronizes media and interaction elements together by using time-dependent graphs (e.g. time-line). The approach offers advanced possibilities for the synchronization of temporal media but provides limited support for logical structuring of information and interaction. An example of this approach is Macromedia Director.

This software consists of two components that are authoring tools itself and a run time environment. The software is based on a movie theatre metaphor including a stage window, cast window, score window, control panel and a paint facility. Most application will involve the development of artwork in the paint facility. Artwork is assigned a cell in the cast member window. Video, sound animation and images graphs can also be imported into the window. The cast members can then be directly placed on stage and assigned a place in the score window. The score sets the sequence that the presentation will run (with time running from left to right on the time-line). The stage window is used to run the presentation, with the control panel being used to run the presentation.

Authoring tools are preferred over programming languages when the application is:

- More display oriented than data oriented.
- Larger number of different screen formats.
- A lot of effects.
- Developed fast

Advantages of authoring tools include:

- Ability to do fast prototyping
- Ease of expanding the prototyping to a full system
- Ease of use
- Built-in multimedia capabilities
- Less need for programming expertise

2.4.2.2 Scripting Language Included in Authoring Tools

Many authoring packages also have a scripting language that is used to add increased flexibility. The scripting language may be used to launch other application, keep track of variables containing a score or a username and so on. Although these are individual to each package and tailored to the functions they will most often be required to perform, they are usually based on a conventional programming language. Example of scripting language includes OpenScript in ToolBook and Lingo in Director.

A language solely drives some authoring packages. These differ from conventional programming languages in that they have been specifically designed with producing multimedia and or CAL application in mind. ScriptX is one such language, an object-oriented language based on SmallTalk, designed to produce any sort of multimedia application. Although the code is oriented to authoring, it still requires an experienced programmer to produce good application for example, Kaleido, who produce ScriptX, anticipate it will take three to six months for a programmer familiar with standard high level languages but not object-oriented technique, to become a proficient ScriptX programmer.

- Publish online documents with headings, text, tables, lists, photos and so on.
- Retrieve online information via hypertext links at the click of a button.
- Design web for educational presentation with various purposes, for use carrying out research or making presentations, including products and etc.
- Include spreadsheets, video clips and other applications directly in their documents.

2.4.3 Programming Language

Specialized authoring packages are not necessary to create multimedia CAL, indeed many multimedia applications are written in high level programming such as C and C++. These offer a number of advantages over authoring packages. Firstly the application may run faster, as the code can be optimized. The main advantage however is the flexibility to make application do whatever we want, limited only by our programming skill. However, the drawbacks are obvious that we must have some programming skill, possibly by great deal and development can take considerably longer than with an authoring package.

2.4.3.1 HyperText Markup Language (HTML)

The publishing language used by the World Wide Web (www) is HTML. HTML allows the individual elements on the Web to be brought together and presented as a collection. In addition to being a markup language for displaying text, image and multimedia, HTML provides instructions to Web browser in order to control the way the documents are viewed. HTML gives authors the means to:

- Publish online documents with headings, text, tables, lists, photos and etc.
- Retrieve online information via hypertext links; at the click of a button.
- Design form for conducting transaction with remote services, for use searching information making reservations, ordering products and etc.
- Include spreadsheets, video clips and other applications directly in their documents.

2.4.3.2 Java

Java is a distributable, object-oriented, cross-platform programming language developed by Sun Microsystems. Additionally, it is a cross-platform language, which means its program can be designed to run the same way on Microsoft Window, Apple Macintosh and most versions of UNIX, including Solaris. Java extends beyond desktops to run on devices such as television, wristwatches and cellular phones. Java is closer to popular programming languages such as C, C++, Visual Basic and Delphi than it is to page-description language such as HTML or simple scripting language such as JavaScript.

Generally the advantages of Java are:

- **Distributed**

Client/server applications are distributed – they distributed their processing workload as well as their information for sharing and collaboration. Because Java supports application because Java supports application on networks (and was designed to do so), it is defined as a distributed language. Java sees no different between open a local file and remote file- the process is equally easy. Java's socket class also supports reliable stream network connections, which provides the ability to create distributed clients and servers.

- **Portable**

Java's portability comes largely from the neutral construction of its architecture. The way that the hardware interprets arithmetic operations also affects portability- while C and C++ platforms can implement arithmetic operations slightly differently, they can be exactly replicated on another. Java's platform-neutral architecture is the first element of its portability- the second is the fact that it would not include "implementation-dependent" aspects of the language specification. The Java environment itself can also be ported to new operating systems and hardware platforms.

- **Multithreaded**

Multitasking occurs when an operating system runs more than one program simultaneously. When those applications are equipped to have more than one thread of execution at a time, that is when multithreading occurs. Having multithreading capabilities simply means that Java is able to run multiple tasks within the context of one large application. Java's multithreading opens the door to a superior level of interactive performance, and makes real-time performance much more exacting. Java can prioritize its threads so that threads of low importance (like garbage collection) are delegated to a low-priority mode. Because people are often not as fast as computers, Java's ability to carry out tasks while waiting is very valuable.

• Dynamic

Java is dynamic because it can adapt to an evolving environment. Java programs are able to allow for new instance variables and method in a library is objects without affecting the dependent client objects. Through it series of interfaces, Java relieves the dependency of complete reconciliation when a parent class is changed, a dependency that C++ code has. Java makes it easier to make adjustment, since a lot of its linkage manipulation can be deferred until run tome. Even from across a network, Java's dynamic abilities will permit the loading of class.

• Secure

Java's securities system has four levels and each of them is armed to prevent corruption. Although security issues have arisen with JavaScript and applet execution, they would not change the fact that Java is an inherently secure language.

There are three features in Java is runtime environment that makes it secure:

1. Runtime memory layout
2. Byte code verifier.
3. File access restrictions

• High Performance

Most Java applications cannot really challenge the speed of C because the code is interpreted, not compiled and there are many runtime-checking operations.

2.4.3.3 JavaScript

It is a popular scripting language on the client side of web application because its availability with every Navigator browser, but it has suffered because of Netscape's numerous and incompatible implementation. It is implemented in Active server Page (ASP) through Microsoft's Jscript. The biggest advantage of JavaScript is that it can be written directly within an HTML file and the code is visible. However, it also has some limitation where it cannot write a file to the web server's hard disk. Another disadvantage of it that there is no any compliant database. Data are stored in array as a replacement of database file.

2.4.4 Comparison of Authoring Tools

Tools	Advantages	Disadvantages
Adobe PageMill Adobe	<ul style="list-style-type: none">• Provides basically the same functionally.• Excellent interface for creating frame layouts	<ul style="list-style-type: none">• PageMill is a basic HTML editor.• More dynamic HTML features are not supported.
Asynetric Corp. for Windows (92) Pathlore Software Corp.	<ul style="list-style-type: none">• Good reporting features• Excellent administration capabilities.	<ul style="list-style-type: none">• Lacks cross-platform development capabilities.• Provides Windows client only• Weak content-creation tools• Lacks built-in messaging
Authorware Attain 5.0 Macromedia Inc.	<ul style="list-style-type: none">• Excellent content-creation tools and animation and special-effects capabilities• Powerful scripting	<ul style="list-style-type: none">• Requires strong programming skills• Needs third-party package for student tracking and course administration

	language for customizing finished courses.	administration
Claris Home Page Claris Macromedia	<ul style="list-style-type: none"> • Excellent library feature for storing frequently-used layout elements 	<ul style="list-style-type: none"> • Limited alignment for text and images • No direct importing of text and images • Preview browser is limited • External browser necessary to use for accurate preview
Corel WordPerfect Suite Corel Corel WordPerfect Suite	<ul style="list-style-type: none"> • Have full graphic and photographic editing capabilities, including GIF, transparent GIF and PhotoHouse 	<ul style="list-style-type: none"> • Less web-style shipping graphic than Word
Digital Chisel Pierian Spring Pierian Spring	<ul style="list-style-type: none"> • Seamless access to the Web • Very friendly interface • Clean design • Customizable levels for schools 	<ul style="list-style-type: none"> • Though containing numerous, HyperStudio still has a slight edge over Digital Chisel
Digital Trainer 4.1 Micromedium Inc. Micromedium Inc.	<ul style="list-style-type: none"> • Comprehensive and flexible features • Good training or testing tool, perhaps for staff development 	<ul style="list-style-type: none"> • Needs more support material for optimum use in school environments
Director 6.0 Macromedia Inc. Macromedia Inc.	<ul style="list-style-type: none"> • Contains a vast selection of resources and features • Very comprehensive package 	<ul style="list-style-type: none"> • Expensive • Numerous features may confuse younger users (adult guidance likely needed)
FirstClass Macromedia Inc. Macromedia Inc.	<ul style="list-style-type: none"> • Comprehensive messaging capabilities • Chat capabilities • Course 	<ul style="list-style-type: none"> • No progress tracking or student self-assessment capabilities • Missing most

	administrative tools	instructor and learner tools of other programs
Flash 3.0 Macromedia	<ul style="list-style-type: none"> • Creating exciting animation and compelling interactivity for World Wide Web pages • Transparency and shape blending effects make it easy to create compelling animations 	<ul style="list-style-type: none"> • Needs third-party package for student tracking and course administration
HyperStudio 3.1 Roger Wagner Publishing	<ul style="list-style-type: none"> • Comprehensive and accessible set of features suited to all ages • Great scripting language appropriate to all grade levels • Excellent teacher training support 	<ul style="list-style-type: none"> • Internet features are not as advanced as those in Digital Chisel
IconAuthor (82) Aimtech Corp.	<ul style="list-style-type: none"> • Powerful tools for custom course creation • Supports Window and Unix authoring • Good animation capabilities 	<ul style="list-style-type: none"> • Requires strong programming skills • Lacks built-in messaging • Weak student tracking and course administration too
LearningSpace 2.0 (97) Lotus Development Corp.	<ul style="list-style-type: none"> • Excellent messaging tools • Strong collaboration features • Good cross-platform development features. • Excellent course administrative. 	<ul style="list-style-type: none"> • Requires Lotus Domino Server • Weak multimedia creation tools • Large per-course hard-drive space requirements
Macromedia Dreamweaver Macromedia Inc.	<ul style="list-style-type: none"> • Dreamweaver provides a good set of tools for web 	<ul style="list-style-type: none"> • Basic layout of application takes getting used to

	<ul style="list-style-type: none"> development • Its capabilities may be a bit overwhelming for the beginning, but once grasps the essential organization it is a powerful application • Working along side macromedia Fireworks, web development is very slick 	<ul style="list-style-type: none"> • Basic and advanced tools are integrated, making the user feel overwhelmed, at times
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Table 2.7 Authoring tools comparison

2.5 Current Multimedia Education Package

2.4.3.4 Online Particle Physics

<http://www.sfu.ca/checai/gencham.htm>

Window or Macintosh program for high school and college student that simulate a particle-detection chamber.

2.4.3.5 FUN@LEARNING.PHYSICS

<http://www.205.216.138.19/~websites/topark/fun/fun.html>

Introductory calculus-based physics course with lessons, interactive simulations written in Java, animation and tutorials available for download via web.

2.4.3.6 Kimia SPM Multimedia by MindSperk Interactive

<http://www.mindspark.com.my/>

Features:

- Attractive and easy to use interface
- Virtual lab let us conduct chemistry experiments using computer.
- 67 interactive experiments will help us to understand the experiment steps effectively.
- 100 + 3D models that can be rotated and zoomed freely.
- 291 interesting graphics.
- 27 animations to describe complex chemical reactions.
- 17 video records on the real world chemical reactions.
- Human voices guide us to navigate the whole system.
- 58 + tutorial pages with text, graphics, animation, video, 3D model, interactive experiments and human voice narrations.
- Little content has been planned and written carefully by experience teachers.
- Chemistry Dictionary helps us to understand the key words.
- “Search” helps us to find anything inside Tutorial module.
- Media gallery is prepared for easy content navigation.
- Memory Conciliator helps us to refresh our memory after learning a lot of information.
- “Self-Test” contains challenging questions for us to answer.

2.4.3.7 Episodic Learner Model The Adaptive Remote Tutor by Elm Research

Group. <http://www.psychologie.uni-trier.de:8000/projects/ELM/elmart.html>

Features:

With ELM-ART are trying to make the benefits of our learning environment ELM-PE available via World Wide Web. This reduces a potential users requirement in hardware and software and lets them choose the time and the place of his or her training more freely.

The Lisp course:

We can see the system at work by looking Lips course. All we need is a HTML browser, capable of dealing with forms, frames and Java Script (e.g. the latest browser for Netscape). We will complete course of six lessons with all the textbook materials, experiments, exercises and mini evaluator at our hand. Our session can be continued later with the system remembering our former interactions.

2.4.3.8 MSC Working Model by MSC Software Corporation

<http://www.hrew.com/products/index.htm>

Feature:

The ward winning MSC Working Model family product is considered the best software available for scientific education. Each product was designed to help educators to be successful in the classroom and laboratory. Visually appealing and easy-to-learn, student is enthusiastic for classes that employ Working Model (WM). WM facilitates of phenomenon without the drudgery of meticulously setting up laboratory experiments.

Educators find that students enjoying the interactive, visually stimulating environment and the speed at which they can expand their understanding of the physical world. MSC products include interactive Physics, Working Model 2D, 3D, FEA. Many of these products are supplementary materials for the best-selling books in physics and engineering. In addition to enhancing students understanding of scientific concepts covered in the classroom, experience with Working Model transitions cleanly into students professional career's MSC. MSC professional products are the standard motion simulation tools used in professional design depart around the world. Working Model supports the design process by allowing students and engineers to design, test and refine virtual prototypes of mechanical assemblies.

2.4.3.9 Knowledge Revolution

<http://www.krew.com>

Makers of Interactive Physics and Working Model. Demo available along with many simulations by Ray Smith.

3.1 Methodology

The development of methodology that has been used for developing this project is the System Development Life Cycle (SDLC). The SDLC is a phased approach to software development, which helps in the use of a specific

CHAPTER 3

METHODOLOGY



Chapter 3: Methodology

3.1 Methodology

The development module or methodology that has been used for develops this project is System Development Life Cycle (SDLC). The SDLC is a phased approach to analysis and design, which holds that system, are best developed the use of a specific cycle of analyst and user activities. This can be divided into seven sequential phases, although in reality the phase are interrelated and often are accomplished simultaneously. The seven phases are:

- Identifying problem, opportunities and needs
- Determining information requirements
- Analyzing system needs
- Designing the recommended system
- Developing and documenting software
- Testing and maintaining the system
- Implementing and evaluating the system

3.1.1 Identifying Problem, Opportunities and Needs

In this phase, activities that have been carried out are identify the problems, state the objectives, definitions and scopes of the current project and finally illustrate the activity schedule until the end of the project.

3.1.2 Determining Information Requirements

In this phase is describes about preliminary investigation on how to obtain an information using the fact finding technique like questionnaire, interview, references on journal or book and also observation.

The main objective of this phase is to gather the data and process it to make a relevant information or retrieving information using for next phase.

3.1.3 Analyzing System Needs

After collecting and obtaining the data in previous phase, system analyst will analysis the data and will draw the exact system requirements. This work will carry out in next phase.

3.1.4 Designing the Recommended System

In this phase is implicit on programming design that enables to support the objectives that have been determined during the feasibility study phase. The main aspect on this phase is to determine the contain of programming modules and also to determine the designing of the effectiveness of user interface and requirements of sources designing purpose. On the other hand, it also includes the suitable type of tutorial questions and related answer. Furthermore the effective method of evaluation also must be carried out.

3.1.5 Developing and Documenting Software

In this phase is to convert the design phase into the relevant source code or programming language likes Java, C++, PROLOG and so on. The system is documented for process of maintenance and also for give the guideline to end user for how to use this system effectively.

3.1.6 Testing and Maintaining the System

In this phase is to debugging the system from any errors that occur for achieving the objective of this project.

Figure 1.1: The main stages of System Development Life Cycle

3.1.7 Implementing and Evaluating the System

In this phase is implicit the evaluation process on this system. This including the strength, limitation and suggestion for additional purpose for this system in the future.

The System Development Life Cycle Stage

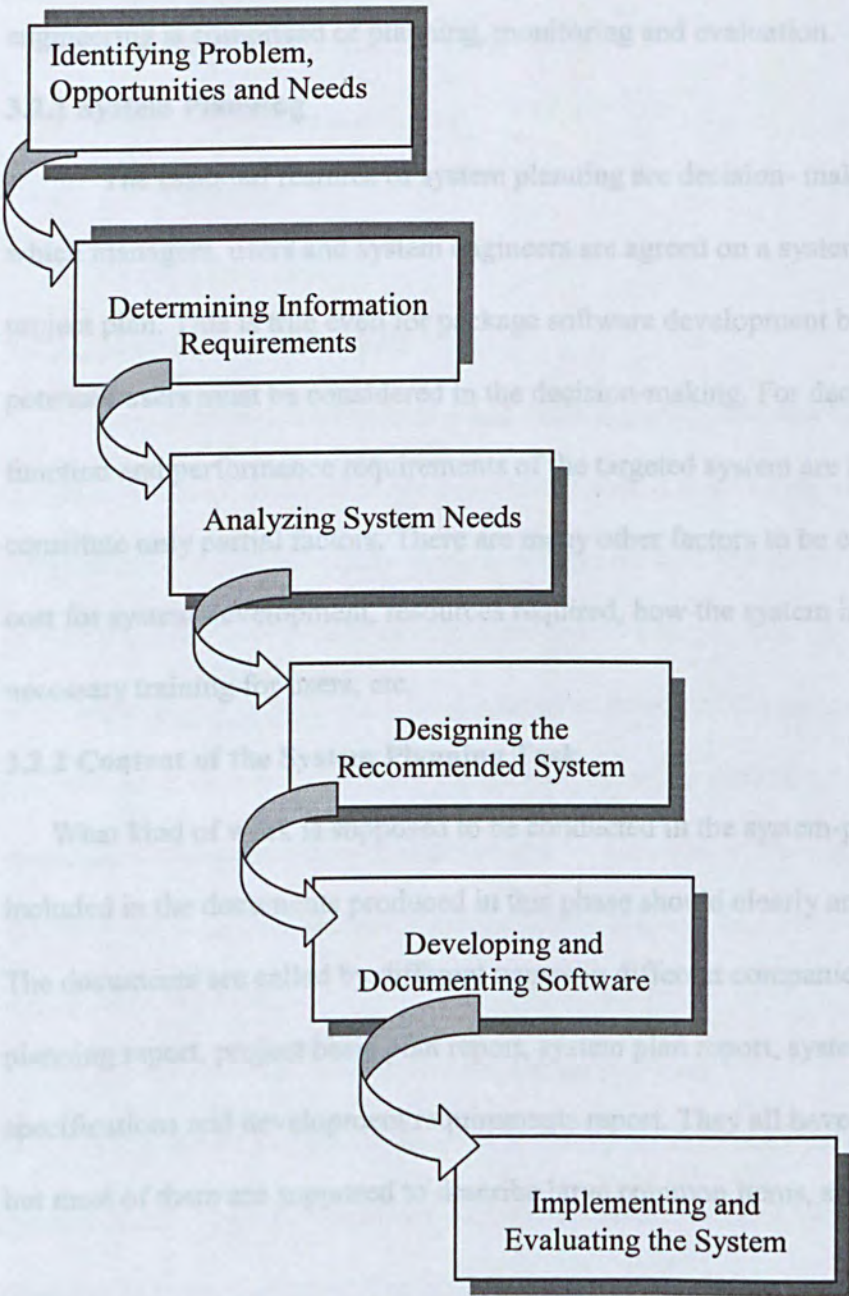


Figure 3.1: The main stages of System Development of Life Cycle

3.2 Project Management

In order to conduct a successful software project, it is important to understand the scope of work to be done, the resources to be consumed, the task to be accomplished, the milestone to be tracked and the schedule to be followed. Project management is necessary in order to deliver the complete system in time. Management in software engineering is comprised of planning, monitoring and evaluation.

3.2.1 System Planning

The essential features of system planning are decision-making. It is a process in which managers, users and system engineers are agreed on a system development project plan. This is true even for package software development because the needs of potential users must be considered in the decision-making. For decision-making, function and performance requirements of the targeted system are important but constitute only partial factors. There are many other factors to be considered- time and cost for system development, resources required, how the system is going to be used, necessary training for users, etc.

3.2.2 Content of the System Planning Task

What kind of work is supposed to be conducted in the system-planning phase? Items included in the documents produced in this phase should clearly answer this question. The documents are called by different names in different companies, e.g. survey and planning report, project basic plan report, system plan report, system overall specifications and development requirements report. They all have differences in details but most of them are supposed to describe large common items, such as:

- Background
- Goal of project
- Problem encountered
- Current status of business
- Part of the system already be systematized
- Overview of the system to be developed
- Effects of system installation
- Cost estimate
- Require resources

3.2.3 Requirements Definition

Requirements definition is a task normally supposed to follow requirement analysis. Actually, this task is not necessarily treated as an independent phase in most of the standards. A part of requirements specification from the user's perspective is written in the output of the system-planning phase, while a large of the specifications from the software engineer is perspective is produced as output of the design phase. Quite a few methods have been proposed that support requirements definition. Most of them are more formal than those for requirement analysis. However, their use in the real environment is limited, probably the usage rate is lower than the methods for requirements analysis.

3.2.3.1 Contents of the Requirements Definition Task

Documents that follow those of system planning are called requirements specifications, basic design report, external specifications and system design report. The outcome of the requirement definition task occupies at least a part of these documents.

Many of the items are written overlap with those in the system planning documents. The following are typical items.

- List of functions
- Relationship between functions and information
- Performance requirements
- Operating requirements
- System configuration
- Timing chart

The objective of requirements specifications are two-fold: one is for the user to clarify the system functions and performance so that their needs the other is for the system designer to proceed with the design and implementation processes using the specifications as the target. Sometimes a third objective for the validation team to compare the developed system with the specifications may be added.

3.2.4 Prototyping

Prototyping is an information-gathering technique useful for supplementing the traditional system development life cycle. When system analyst uses prototyping, they are seeking user reactions, suggestions, innovation and revision plans in order to make improvements to the prototype and thereby modify system plans with a minimum of expense and disruption. Systems that support semi-structured decision-making (as decision support system does) are prime candidates for prototyping.

Some analyst argues that prototyping should be considered as an alternative to the SDLC. Complaint about going through the SDLC center around two main concerns, which are interrelated.

The first concern is the extended time required to through the development life cycle. As the investment of analyst time increases, the cost of the delivered system rises proportionately. The second concern about using SDLC is that user requirements change over time. During the long interval between the time user requirements are analyzed and the finished system is delivered, user requirements are involving. Thus, because of the extended development cycle, the resulting system may be criticized for inadequately addressing current user information requirements.

3.2.5 User Interface Design

The interface is the system for the most users. However, well or poorly design, it stands as the representation of the system and by reflection the competence as a system analyst. Our goal must be to design interface that help users and businesses get the information they need in and out of the system by addressing the following objectives:

- Effectiveness as achieved through design of interface that allows users to access the system in away that is congruent with their individual needs.
- Efficiency as demonstrated through interfaces that increase speed of data entry and reduce errors.
- User consideration as demonstrated in designing suitable interfaces and providing appropriate feedback to users from the system.
- Productivity as show through following ergonomically sound principles of design for user interface and workspaces.

CHAPTER 4

SYSTEM

ANALYSIS



Chapter 4: System Analysis

4.1 Fact Finding Techniques

Information regarding the needs, views and suggestions of possible of online learning Intelligent Tutoring System (ITS) method is collected for further analysis. Before performing the details analysis of the requirement for this learning method, facts have been gathered by: -

4.1.1 Reading

Reading has been done to look for current existing this intelligent learning method or its equivalents. Journals, articles, books, newspapers and computer magazine have been referred for gathering some information.

4.1.2 The Internet

Internet is the largest information warehouse around the world. As such, it is used to get information on the same or similar system. Primarily, the Internet played an important role during fact gathering. Searching through the Internet, typing an exact keyword will yield a lot of useful materials.

4.1.3 Interview

In this fact finding technique, information have been collected form some individuals through face-to-face interaction and to obtain the opinions of the interviewee and also his/her feelings about the current state of the system and informal procedures. The sample of interview sheet that used for this project survey is attached on Appendix B section.

Figure 4.1: Analysis of the Interview

4.1.4 Questionnaire

It is a special purpose documents to collect information and opinions form respondents. It also has opportunities to study attitudes, beliefs, behaviors and characteristics of several key people who may be affected by the current and proposed system. The sample of questionnaire that used for this project survey is attached on Appendix section.

4.2 Analysis Towards Data Gathered During Fact Finding

4.2.1 Interview

The following information had been gathered during the interview session.

Interviewee: Mr. Lee Pek Feng

Interviewer: Rakesh s/o Jaya Prakasam

Date: July 25, 2001

Venue: Sekolah Menengah Westland, Penang

Conclusion form the interview:

Mr. Lee Pek Feng was fully agreed on this type of learning method and he said that beside to prepare for the examination particularly on Physics subject, student also have gained an interest on computer field. He also added that the Information Technology (IT) is the one who has conquered the world, so when the students has finished their studies later, they will have a great working opportunities. He also has suggested that this learning method is suitable for last-minute preparation for examination. Added with graphic animation, sound effect in this system will aid the student interest on this subject and perhaps there have a chance to enhance the student performance on incoming major examination like SPM or STPM compare with past year performance on the average level. Finally, he said that this learning method is more convenient for student and it can be used at any time. Furthermore they also can save their time by preventing to attend an extra class or tuition. He hopefully in the future, that this kind of tutoring system method will be increased for all other subject as well.

Figure 4.1: Analysis of the Interview

4.2.2 Questionnaire

Analysis on Student Respondent Through Questionnaire
Agree and Disagree on Learning Through Online ITS Method

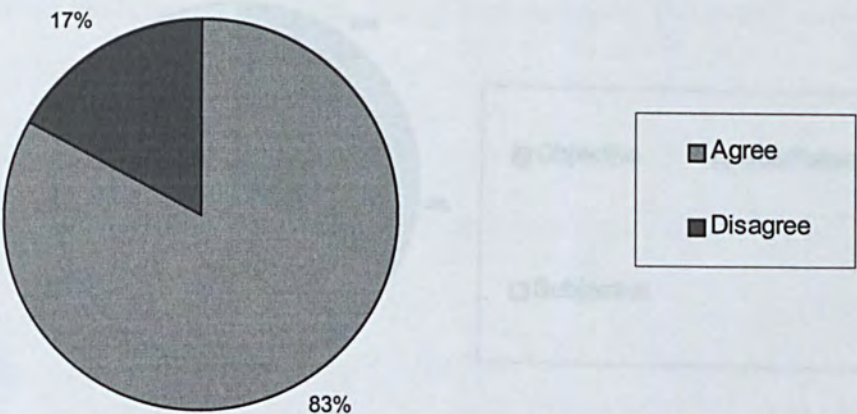


Figure 4.2: Pie chart 1 – Analysis on Questionnaire

Figure 4.2 has shown about analysis that had been taken towards student's respondent through questionnaire that conducted at Sekolah Menengah Westland Penang. From this pie chart, we can identify that about 83% of students has been agreed on this online learning intelligent tutoring system method for their latest and flexibility way of studies and other small sector of this chart has shown that this student disagrees on this type of learning method. Maybe they are not interest in Physics subject or do not know how to use of computer.

Difficult type of questions on examination

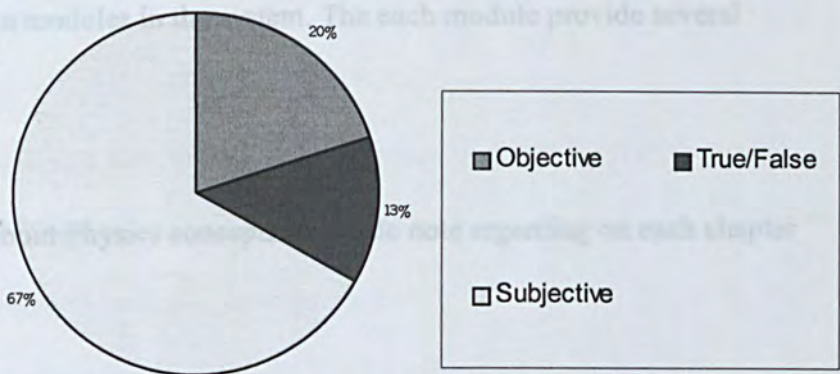


Figure 4.3: Pie Chart 2 - Analysis on Questionnaire

Figure 4.3 has illustrated that analysis has been conducted through questionnaire for identify the difficult type of an examination questions that has responded by Sekolah Menengah Westland's student. From this chart we can say that about 67% of the students were said that subjective is the difficult type of question to answer in any major examination. This means that there need to recall for long time to answer for this kind of question and some of the subjective questions are really cannot understand by the student. The true/false type of questions is the easiest question for students when compare with objective and subjective type of questions.

4.3 Functional Requirement

The following are some of the functional requirement of the package.

- Fulfill the SPM is four main topics out of seven that set by the Malaysian Council Examination (MPM).

- Interactive tutorial part to enable user take a self-test after learning the Physics models, laws, principals, concepts and theories.
- Make use of the multimedia to elaborate some of the Physics concept.

Overall there are six main modules in the system. The each module provide several function:

4.3.1 Learning module

The students will learn about Physics concepts in a little note regarding on each chapter the module is present.

4.3.2 Tutorial module

The student will be required to do a tutorial for each chapter for evaluating their understanding on that chapter. After that, the system will display the result and give advice if they obtain a low mark.

4.3.3 Exercise module

The student will be asked to do four types of questions to evaluate their understanding in Physics concept, calculation, formula and experiment theory.

4.3.4 Experiment module

The students will be guided and narrated by system (using voice), how to implement the experiment work and the analysis of that experiment.

4.3.5 Formula module

Provides the Physics formula for reference.

4.3.6 Examination module

The students will require sitting for the exam. The system provide one hour and 15 minutes to them to accomplish all the questions.

4.4 Non-Functional Requirement Analysis

Non-functional specifications are the constraints under which a system must operate and the standards, which must be met by the delivered system. The non-requirement of the systems is:

4.4.1 User-friendliness

The system is required to have a very user-friendly interface because most of the users are students, who are non-technical users. The designing of the screens includes:

- Using an attractive background color or picture
- The topics are described in short notes.
- Provide animation and graphics picture to help user to better understand of Physics.
- Provide some application that performs the Physics experiment with the voice narration.
- Evaluating the student's understanding of Physics concept, formulas, calculation and analyzing of experiment work.

4.4.2 Flexibility and Manageability

The application should have the capability to take advantage of new techniques and resources and can be implemented in changing environment. The modules within the system should be easy to manage. This will make the maintenance and enhancement works simpler and not too time consuming.

4.4.3 Usability

This Web package should be developed in such a way it is easy to use. Human interfaces need to be intuitive and consistent with other modules in the environment and the within themselves. Furthermore, the web package should be able to guide the student to understand well about the lesson and performs as important references for examination.

4.5 Run-Time Requirement

4.5.1 Hardware Requirement

To better performance for this package, the user's computer should have the following basic requirements. There are:

- Intel Pentium 166 MHz or better
- Minimum 32 MB RAM
- 56 kb/s modem
- 16 bit sound card
- Speakers
- Mouse

4.5.2 Software Requirement

To host and run the package, the users computer needs to have the following support software that has listed below.

- Internet browser (Microsoft Internet Explorer or Netscape)
- Authorware Web Player (this software is freely can get it in www.macromedia.com)
- Notepad

- DDL support system

4.6 System Analysis

System analysis is the process of gathering and interpreting facts, diagnosing problems and using the information to recommend improvement to the system. Through the system analysis, the developer may add, delete and modify the system components toward the goal of improving the overall system. The information are gathered during this phase has provided alternative strategies to develop this system.

4.6.1 Objectives of System Analysis

Following are some of the objectives of the analysis:

- To identify what are actually needed by the proposed user
- To identify the major modules to be included in this package
- To acquire knowledge on how this web package will be developed with the current new emerging technique.

4.6.2 Development of System Analysis

The analysis on the development tools for the package had been done in this stage. After reviewing and analyzing the requirements, the tools for developing the systems are identify. These tools include the entire platform and development software. Besides considering the suitability of the tools to fulfill the requirement, the tools used must be able to interact to each other. Following are the development tolls used in the development process.

4.6.2.1 Operating System and The Platform

In the analysis for the entire platform, the Microsoft products are used as the main technique producer.

- **Microsoft Windows 98**

Win 98 has been chosen to be the platform for this system. The Microsoft Window 98 operating system is the upgrade to Window that makes the computer work better and plays well. It works better by providing a good system performance along with easier system diagnostics and maintenance. With this operating system, the system plays better as well with support for the latest graphics, sound and multimedia technologies, the ability to easily add and remove peripheral devices with support for Universal Serial Bus (USB). The targets of the users for this system are secondary school students. Most of them are using computer and some of their computer are installed with Wind 98 operating system. So, Window application was used as the platform to run the learning package. Also, most of the development tools for this system such as Microsoft Visual Basic, Microsoft Office 97, etc are from the same software vendor.

4.6.2.2 Development Software

Software is the application that the uses to develop the system, like programming and authoring tools. Choosing the suitable software to develop the system, it will simplify the work done by the programmer as well as reduced the time needed to build the system. Following are the software that used to develop the system:

- **Authorware Attain 5.0**

The main tool used to develop this package is the Macromedia Authorware. It is a tool that used to develop computer-based training and learning modules. It has a cross-platform capability and the program is either Window or Macintosh based.

- **Java Script and HTML**

Java script is use for doing a scripting based programming that can be attached directly to HTML source code and also in Authorware application. It is simply to use because this programming are straightly applied like we planned any algorithm without doing compiling process. HTML is used for to create a web page.

- **Adobe PhotoShop 5.0**

It has been used to design and modify the graphical picture that is needed for the package. Most of the pictures were scanned then do some design using this software and pasted it into the system. Adobe PhotoShop 5.0 is suitable software to modify and improved the quality of the pictures and figures.

4.6.2.3 Hardware Used for Develop this System

- IBM compatible computer. This is the computer used throughout the develop phase.
- CD-ROM driver. 10 times speed is acceptable levels in the case of reading computer data.
- Five gigabytes hard disk. A large storage hard disk is needed to build a large multimedia-learning package.
- 300 x 600 dpi scanner. Scanner is needed to do scanning the picture form the Physics reference books to prepare the SPM Physics topics.
- Speakers for to test for audio and voice property.
- Microphone is used for recording the voice.

4.6.2.4 Software Used for Develop this System

- Macromedia package. To develop the system.
- MP3 audio software used for recording voice purpose.
- File Transfer Protocol (FTP). It is used for uploading the system into the Internet platform.
- Java software for testing the Java Script source code.
- Front Page is used for develop the web page.

4.6.2.5 Microsoft Word 98

The powerful word processor was used through out the development process. It is used in preparing the Physics note. It includes text, data and graphics from other application to create high-impact documents. We can design graphics with 3-D effects and animated text using the new office art tools in the Office 98 application. Word provides also many new drawing tools and capabilities that can be easily accessed through the new drawing toolbar. Users can easily embellish the text and graphics using the hundreds adjustable AutoShapes, four types of fill effects, multi-colored gradient, textured, transparent and picture. It enhances document quality and enables symbol-embedding functionality.

CHAPTER 5

SYSTEM

DESIGN



Chapter 5: System Design

5.1 Introduction

System design is the evolution of the alternative solutions and the specification of a detailed computer-based solution. During the phase, the detail of how the system will meet the requirements identified during requirement phase is described. Then, the user requirements will be transformed into a working model. A working model is used as guidance to developer before developing the complete system. The following are the components of the system design.

- User requirement
- System requirement
- System functionality design
- Graphical user interface design process design

5.2 System Function Design

Intelligent Tutoring system (ITS) is developed by using an “architecture approach” which consists of three different layer that is the user interface layer, data layer and the transaction layer. A layered paradigm has many benefits that help to meet the system objectives in application development. There are:

- Maintainability

Code is organized in a recognized manner. Task oriented code is centrally located.

- Reusability

Task-oriented code is easily developed for reuse, specifically for task that cross application boundaries.

- Testability

Module can be tested easily. Modularization breaks up the code converge tasks into smaller manageable units.

- Speed

Modular code a sagely be optimized without affecting the calling procedures.

5.2.1 System Structure Chart

The layout of structure chart shows that the web package starts from the beginning screen.

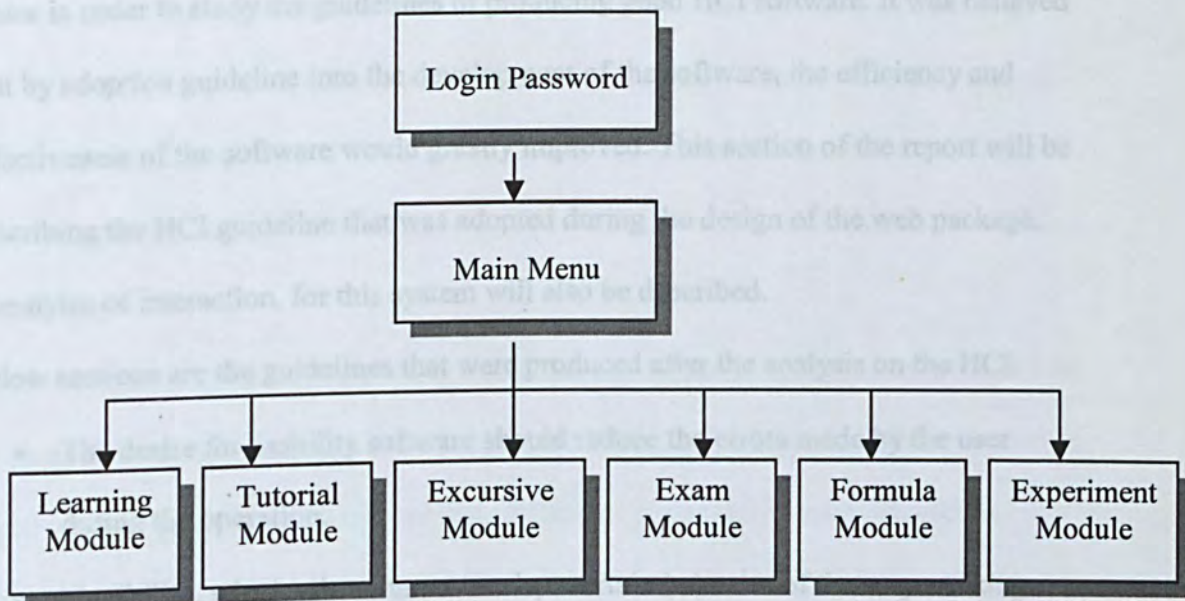


Figure 5.1 System Structure Chart

5.3 User Interface Design

The interface of a system works as a central communication between the processing functions and the user request. The interface is aimed to improve the efficiency and effectiveness of the user when using the entire system. The user interface design should be easy to understand and easy to use.

The Intelligent Tutoring System (ITS) design is focusing on the effective general interaction between the user and the system, complete, unambiguous and easy to understand information display.

5.3.1 Consideration of Human Computer Interaction (HCI) Factors

HCI factors has been given consideration because of its important in providing effectiveness in interactive with the user which is important in the development of SPM Physics learning web package or ITS. Analysis has been done on the discussion of HCI factor in order to study the guidelines of producing good HCI software. It was believed that by adoption guideline into the development of the software, the efficiency and effectiveness of the software would greatly improved. This section of the report will be describing the HCI guideline that was adopted during the design of the web package. The styles of interaction, for this system will also be described.

Below sections are the guidelines that were produced after the analysis on the HCI.

- The desire for usability software should reduce the errors made by the user during the operation.
- Flexibility, which allows users to adapt certain behavior of the way working habits to the software that has been taken into consideration by allowing changing of certain user interface color and different types of commands available to the users.
- Use of color. The combination of color in user interface is important in the productivity and user-friendliness of the software. Therefore, colors that are used

in this user interface of the software will be carefully chosen. Besides, attractive and appropriate color will be used in areas where the attention is required.

- Color will be used whenever necessary for differentiation and identification purpose. All the titles, menus and commands as well as the different kinds of information will be represented by different combinations of appropriate greatly enhance the visibility and comfort of users.
- Font selection. Fonts have many functions in addition to provide letterforms for reading like other visual elements, fonts can be used to create a mood, motivate people and organize information. By varying the size, weight and position of fonts, we can create a hierarchy of information like color, the selection and use of fonts can greatly affect the user attitude towards a user interface. Particular emphasis during the developments of the package was placed on the use of fonts.

5.3.2 Consistency

Physics subject interface design takes consideration into the consistency of the interface for menu selection display. For example a particular button is used to represent a simple meaning. The same button that represents different actions or objects will lead to confusion. The object and operations provides are designed to form minimum and consistent set so that the system is easy to learn and apply.

5.3.3 Minimizing Memorization

The operation is and interfaces are structures so that they are easy to understand and to remember. For example, using one key or button for all add operations is easier to that a number of difference keys to different types of add operations.

5.3.4 Feedback

The system shows feedback to the user after a process is performed. Feedback is used to inform the user whether the process has been performed successfully or not.

5.3.5 Help Message

The design considerations also focus on providing the meaningful help message. The message will describe the function of a button in the software whenever user want to find out what will happen if he or she presses the button.

5.3.6 Minimize the Number of Input Actions

The minimum amount of typing can be accomplished by using the mouse to select from the predefined sets of input. Besides, a 'sliding scale' can be used to specify the input data across a range of values.

5.3.7 Human Computer Interface General Principles in GUI Design

- Be consistent and ease of use, which mean use a consistent format for command input, data, display, menu or button selection and placing of the control objects. Use of standard or consistent labels, font and abbreviations in the frame.
- Ability of the user to take corrective action once an error has been recognized.
- Produce meaningful error messages that describe the problem in jargon that the user is able to understand. The system should protect itself from use error that might cause it fail.
- Allow user to return to the previous state or screen.
- Categorize activities by function and organize screen geography accordingly.
- Use short and meaningful command concise name is easy to memorize and reduce typing mistake.

- How the user perceives the rate of communication with the system.
- Provide relevant help topic for current state.
- Display only information that relevant to the current operation. The user should not have to go through extraneous data and menus in order to obtain information or to access certain screen. For example, display the tree directory in the drive, where user just can click on the subfolder of that directory and cannot click on other directory for display the extraneous data.
- The page elements (graphics, animations, font size, picture and other) of an acceptable size when viewed at 800 by 600 and at least 16-bit true color resolution.

5.4 Intelligent Tutoring System Screen Design

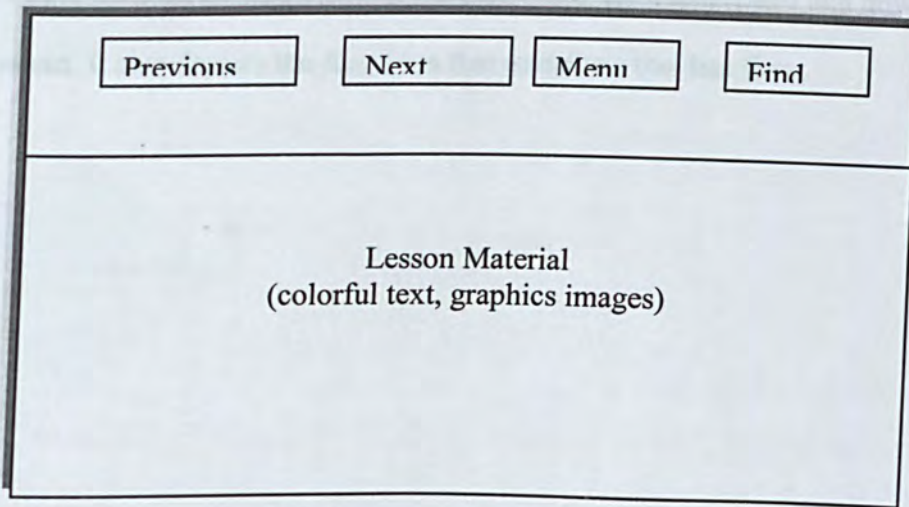


Figure 5.2 Screen Design on Learning Module

The design of the graphical user interface for Physics ITS is divided into the Learning screen (table above), Tutorial screen, Examination screen, Experiment screen, Exercise screen, Formulas screen and Logon screen. To use the function of the package, the user just need to click on the selected task.

The graphical interface design for the system is normally divided into two or three frames (table above only show two frame). The top frame contains the navigation control like go to next screen or page or return to main menu while the center frame contains the lessons materials.

5.5 Process Design

Intelligent Tutoring System web package for Physics SPM is designed based on the structured design technique. Structured design is a process-oriented technique for breaking up a large program into a hierarchy of structure chart of modules that result in a computer program, which is easier to implement and maintain.

5.5.1 Data Flow Diagram (DFD)

DFD is used to represent the input and output of data and processes in this system. DFD shows how the data flow into the system, how they are transformed and how they leave the system. It also depicts the functions that transform the data flow.



Figure 5.3 function of Data Flow Diagram

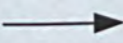




Symbol	Function	Descriptions
	Data Flow	<ul style="list-style-type: none"> • Represent the flow of data or information one object to another • Arrow describes the directions of data flow • Each data flow is label with the name or details of the information represented by the data flow.
	Data Store	<ul style="list-style-type: none"> • Hold data for a time within the system. Comprise two sections: • Identifier information • Description of data stored
	Entity	<ul style="list-style-type: none"> • Any objects in the real world. For example person.
	Process	<ul style="list-style-type: none"> • Transform the input data to output data-comprise two or three section. • Top section contains the identifier information • Center section contains a description of the process • Lower section contains the physical location or computer program information
	Decision	<ul style="list-style-type: none"> • Use for if-else statement • Flow of two processes in different path

Figure 5.3 function of Data Flow Diagram

5.5.1.1 Data Flow Diagram Login Module

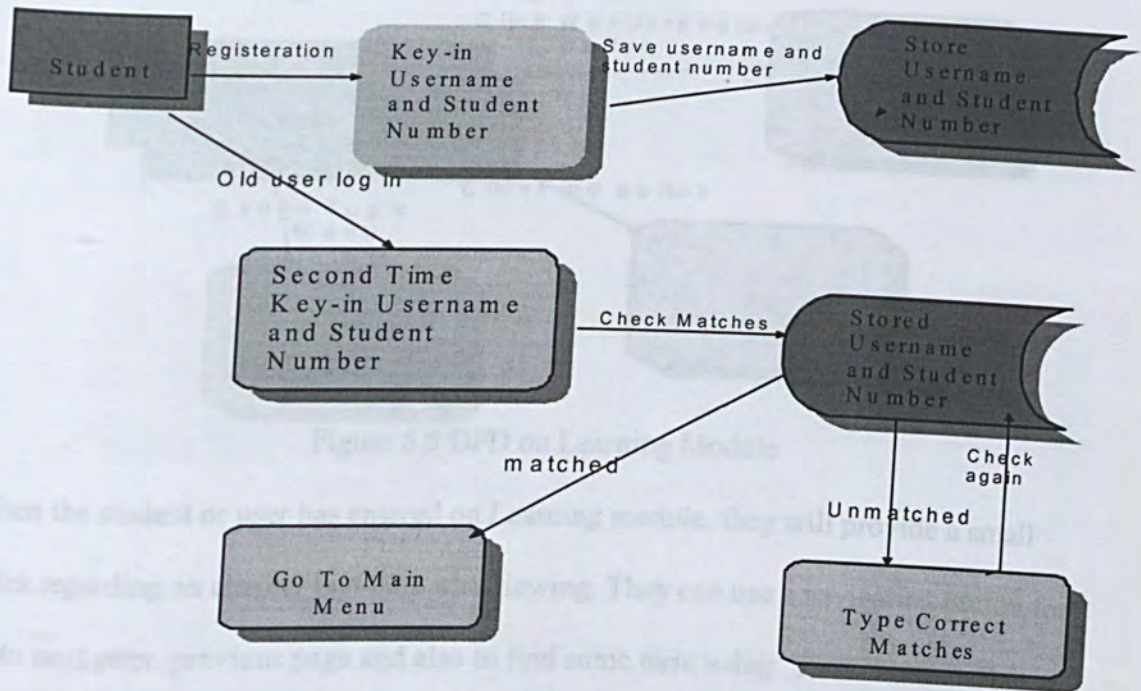


Figure 5.4 DFD Login Module

When a user or student who want to register to this learning system for the first time, the system will be required user's username and student number to log-on purpose. Then this username and student number will be stored by this system. For the next time they log-on to the system, the system will check their legal username and student number. If it is matched, they are allowed to precede the learning activities or not the system will repeat ask their right username and student number.

5.5.1.2 Data Flow Diagram on Learning Module

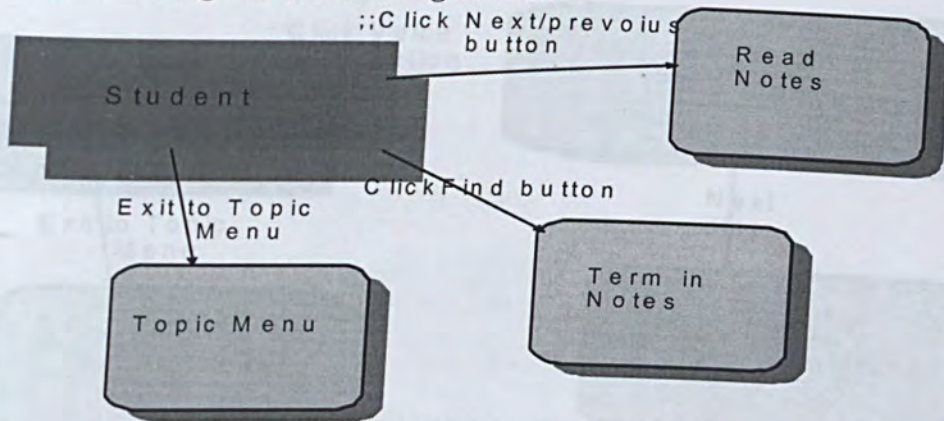


Figure 5.5 DFD on Learning Module

When the student or user has entered on Learning module, they will provide a small notes regarding on chapter that they was viewing. They can use a navigation button for go to next page, previous page and also to find some term using "Find" button. This module is using a sequence flow of data method.

5.5.1.3 Data Flow Diagram on Formula Module

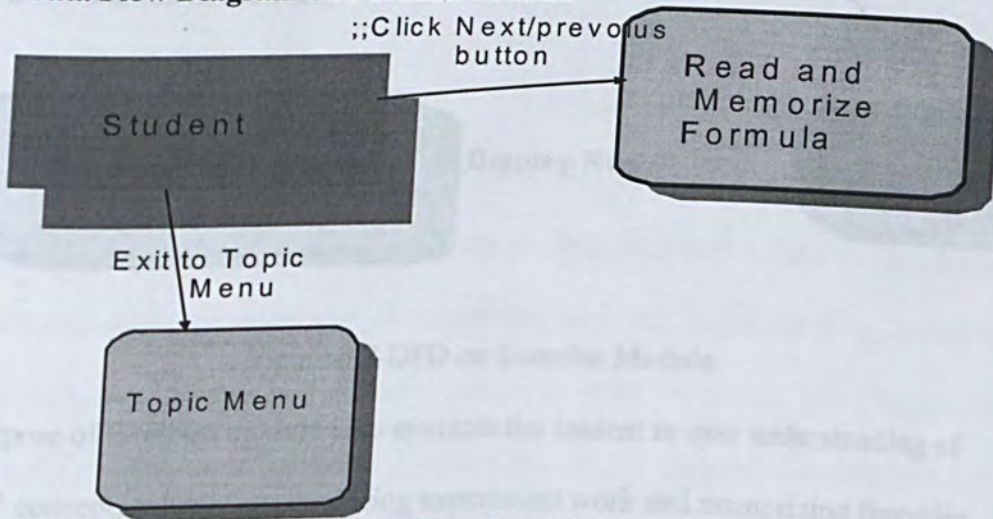


Figure 5.6 DFD on Formula Module

When student or user has entered on Formula module, the system will provide formulas for every topic. They can use it when they solve a calculation part. Use a navigation part to go to next page or to previous page. This module is working on sequence of data flow.

5.5.1.4 Data Flow Diagram on Experiment Module

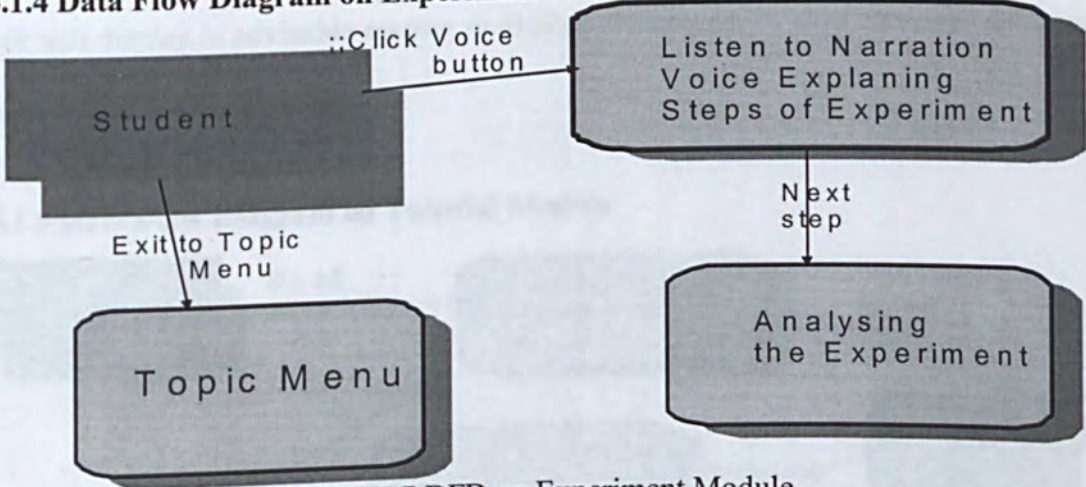


Figure 5.7 DFD on Experiment Module

5.5.1.5 Data Flow Diagram on Exercise Module

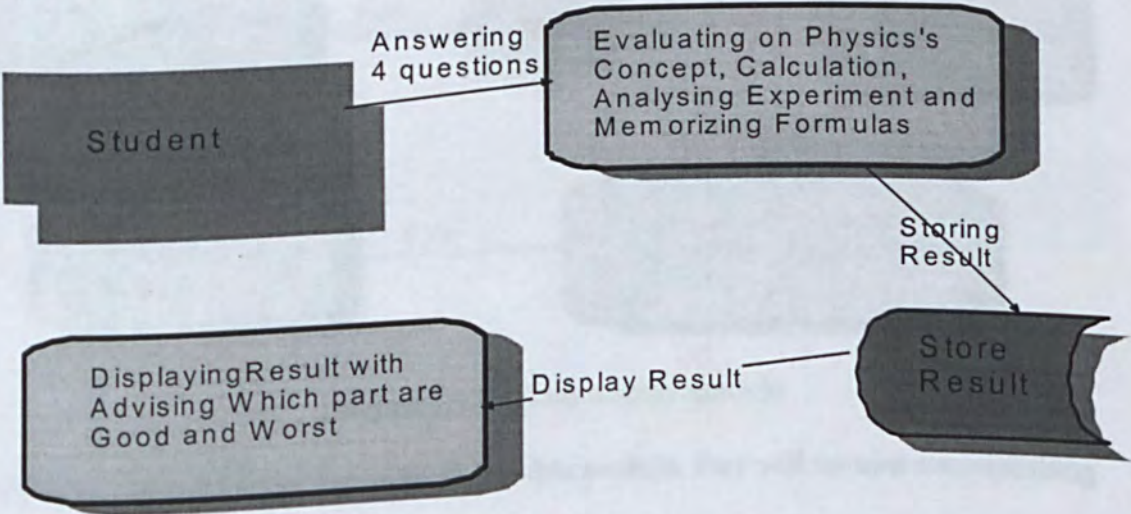


Figure 5.8 DFD on Exercise Module

The purpose of Exercise module is to evaluate the student or user understanding of Physics' concept, calculation, analyzing experiment work and memorizing formulas. When student or user entered on this module, there will be given four questions.

After answering all the questions, the result will store the student score and then the score will display in advisable manner to explain which part are they very poor and good in which will produce in a table.

5.5.1.6 Data Flow Diagram on Tutorial Module

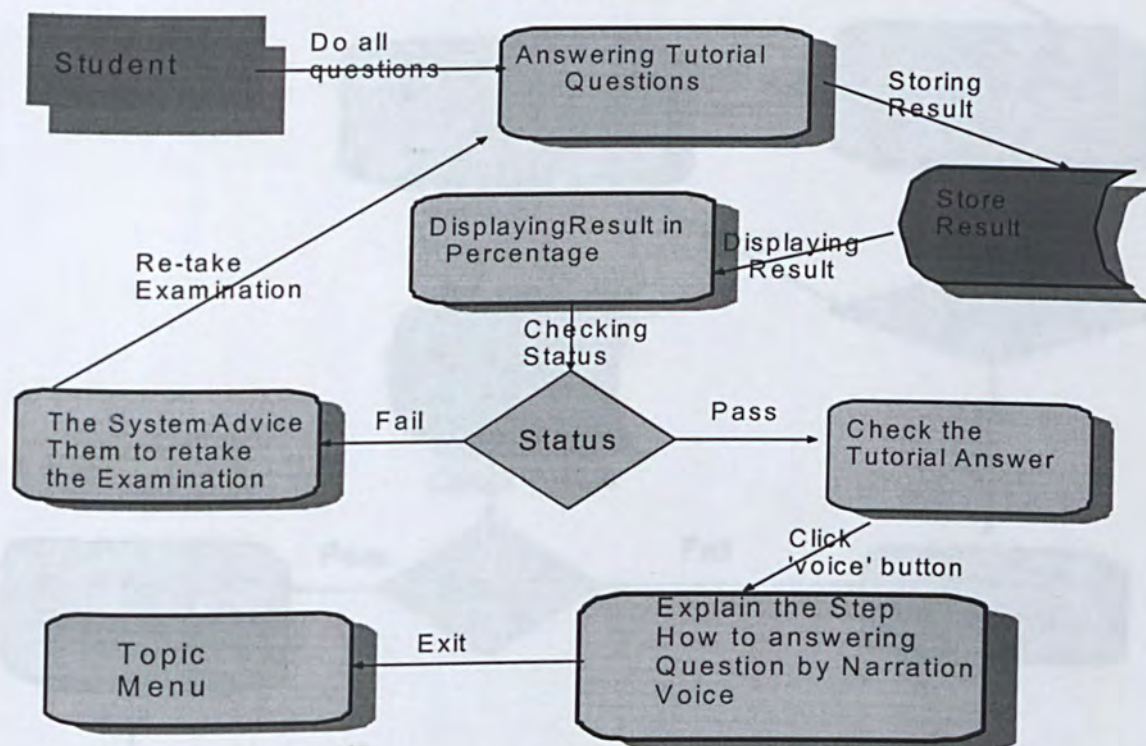


Figure 5.9 DFD on tutorial module

When the student or user has entered into this module, they will require accomplishing all the tutorial questions. After that, the score will store and display to them. If they have failed in the tutorial, the system will advise them to retake the tutorial else if they have passed in the tutorial, the system will congratulate them. Then they will check for the tutorial answer. The voice's narration will explain to them how to solve the tutorial question. Finally exit the module.

5.5.1.7 Data Flow Diagram on Examination Module

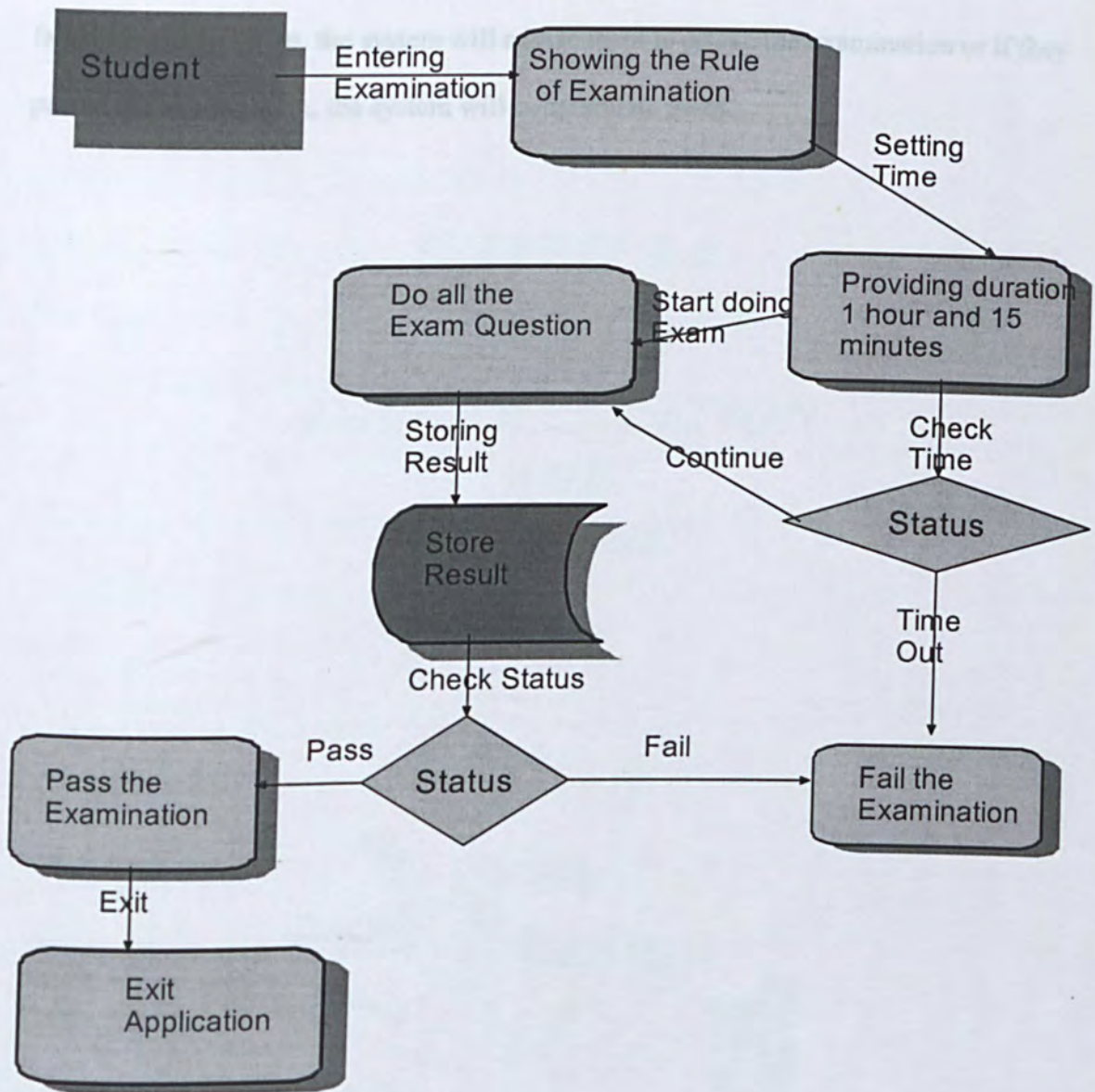


Figure 5.10 DFD on Examination Module

When the student or user has entered into this module, the system will display the rule of examination that must follow by them. Then they begin to do examination question. The system will set the time (one hour and 15 minutes) to accomplish all the questions within this time. If the time is out, the system will consider them as failed the examination.

After finishing all the questions, the score will be stored and display to them. If they failed the examination, the system will advise them to retake the examination or if they passed the examination, the system will congratulate them.

CHAPTER 6

SYSTEM IMPLEMENTATION AND TESTING



Chapter 6: System Implementation and Testing

6.1 Introduction

System implementation is the construction of the system and the delivery of that system. This chapter discusses system implementation, including building and testing the system, which is also called the construction phase of the system.

Another important aspect of the system implementation phase is the program testing.

6.1.1 Development Phases

Using software development phases, we can develop or construct a system. The development phases are: Requirements, Analysis, Design, Coding, Testing, and Maintenance. The development phases are shown in the Figure 6.1.



Figure 6.1: Development Phases

Chapter 6: System Implementation and Testing

6.1 Introduction

System implementation is the construction of the system and the delivery of that system into 'production'. System implementation includes building and testing the system, which is also called the construction phase. Construction phase of the system involves the conversion of the system requirements and designs into program codes.

6.1.1 Development Environment

Using suitable hardware and software can speed up system development or construction. The development model selected for Intelligent Tutoring System (ITS) is prototyping model. The prototyping model consists of six steps as shown in the figure 6.1.

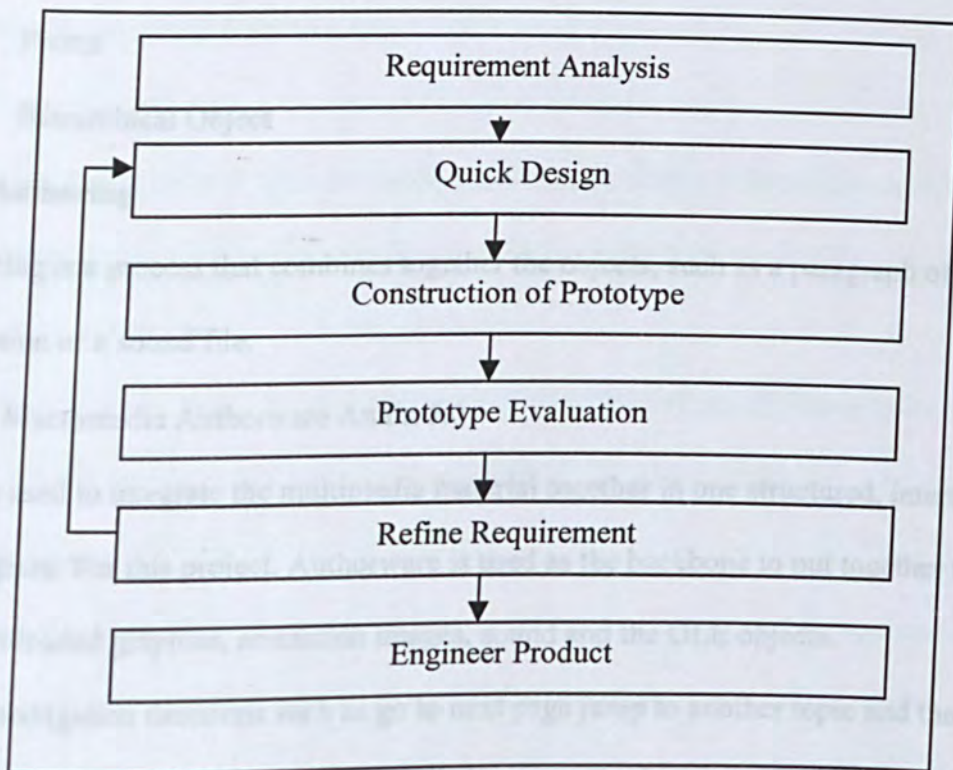


Figure 6.1 Prototyping Model

The prototyping method used for ITS is evolutionary prototype. Prototyping model is selected for the development of this project because:

- The potential for changing the system early in its development.
- The possibility of developing a system that more closely addresses user's needs and expectations.
- Misunderstanding of the requirement or missing functions can be identified and redefined.

6.2 Authoring Methodology

The following are the methodology used by authoring tools:

- Scripting
- Iconic/Flow Control
- Frame
- Hierarchical Object

6.2.1 Authoring

Authoring is a process that combines together the objects, such as a paragraph of text, an illustration or a sound file.

- Macromedia Authorware Attain 5.0

It is used to integrate the multimedia material together in one structured, interactive program. For this project, Authorware is used as the backbone to put together the downloaded graphics, animation images, sound and the OLE objects.

The navigation functions such as go to next page jump to another topic and the menu bar's functions also created by using Authorware. For instance, the framework icon is used to sets up an environment designed to make creating navigation easy.

Therefore, users navigate through part of the program by clicking a button. Scripting language functions like *jumpfile*, *goto*, *quit*, etc, are used to allow the users go to particular topic.

6.3 Coding Principles

Coding is a process that translates a detail design representation of software into a programming language realization. Notes that, the coding section just involving the build of interactive application part and for creating a web page, which is implemented by using Java Script and HTML. The following coding principles were applied during the implementation of ITS.

- Coding conventions

Coding conventions such as program labeling, naming conventions, comments and indentation should be adhered to.

- Readability

Codes should be easy to understand. Adherence to coding conventions such as naming conventions and indentation contribute to program readability.

- Maintainability

Codes should be easily revised or corrected. To facilitate maintenance, code should be readable, modular and as general as possible.

- Robustness

The codes should be able to handle cases of user error by responding appropriately; perhaps with a diagnostic error message and system failure should not result.

6.3.1 Event Driven Programming

The interactive application part for ITS was coded using the event driven programming approaches. Event driven programming is a program was written for Microsoft Windows execute tasks in response to event. Examples of events are closing or resizing a Window, mouse clicks and keyboard input.

6.4 Coding

The design of the system must be translated into a form that can be understood or run by the machine. The code generation steps perform this task. ITS interactive modules were written using Java Script.

6.4.1 Methodology Used

Method used for coding for this ITS interactive module is a top-down method where high-level modules will be coded first and the lower modules will be left, which to be filled later. The lower module is only a shell with an entry and an exit. This approach is used to allow testing to begin on some of the modules while others are still being coded.

6.4.2 Development of ITS Interactive Module

ITS interactive module follows a modular design partitioning. The system is divided into modules is a simple parts with self-contained functions and interface, so that the complete design of the system can be accomplished by:

- Designing a set of modules.
- Specifying how modules communicate with each other

This approach makes both the design and implementation easy and efficient.

6.5 Testing

Testing is a verification and validation process. Verification refers to the set of activities that ensure the software correctly implements specific functions. It involves using test data and scenarios to verify that each component and the whole system work under normal and abnormal circumstances.

Software testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. Rules that can serve as well as testing objectives are:

- Testing is a process executing a program with the intent of finding an error.
- A good test case is one that has a high probability of finding an undiscovered error.
- A successful test is one that uncovers a yet undiscovered error.

A system is exposed to testing both during the development phase and during the test and integration phase. During the development phase each function or procedure that is a part of a module is independently developed and thoroughly tested until the entire module is complete. The major difference between testing a module during its development phase and testing it during the test and integration phase is that; during the development phase, errors are fixed as they can be found. While during the test and integration phase, failures, if any, are recorded and the failed module returned to the development team along with an explanation of failures experienced.

6.5.1 Testing Process

Testing was conducted throughout the development of ITS web package for SPM Physics. The testing process consists of unit testing, integration testing and system testing.

6.5.1.1 Unit Testing

Basically, quality software relied on testing each function and module. This practice has been called unit testing, which effective time-consuming and labor-intensive. Using the detail design description guide, important control paths are tested to uncover errors within the boundary of the module. The relative complexity of tests and errors detected as a result is limited by the constrained scope established for unit testing. Unit testing is also referred to as module testing and is usually performed by the system developer. For ITS, unit testing was done during developing phase, that is those module related. After a module has been developed, reviewed and verified for the correct result. The module was tested to ensure that it operates correctly.

6.5.1.2 Integration Testing

Testing a specific feature together with other newly developed features is known as integration testing. Testing the interface of two components explores how the components are interacting with each other. Integration testing approach was applied during the development of ITS. It was constructed and tested in small arguments, where errors were easier to isolate and correct. Error will be corrected before proceeding to the next integration.

6.5.1.3 System Testing

System testing is designed to reveal the bugs that cannot be attributed to the individual component or to the interaction among components and other objects. System test studies all the concerns issue and behaviors that can only be exposed by testing the entire integrated system or a major part of it. System testing includes testing for performance, stress, security, configuration sensitivity, usability, data integrity, start-up and recovery. There are several steps to test the system:

- **Function Testing**

System testing begins with function testing. The first steps focuses on the functionality. Each function can be associated with those system components or modules that accomplish it. For some functions, the part may comprise the entire system. Logically it should be easier to find the cause of a problem in a small set of modules than in a larger set. Effective function tests have a probability of detecting a fault. ITS has uses some guidelines for function testing that have listed as below:

- i) Have a high probability of detecting a fault.
- ii) Know the expected actions and output.
- iii) Test both valid and invalid input.
- iv) Never modify the system just to make testing easier.
- v) Have stopping criteria.

- Performance Testing

When the system has performed the functions that has required by the requirements, it turn to the way in which those functions are performed. Thus, functional testing addresses the functional requirements and performance testing addresses the nonfunctional requirements. System performance is measured against the performance of objectives set by the user as expressed in the nonfunctional requirements. In this system, performance testing has examines how well the Physics calculations are done, how each module has work in one system and how the user interface interaction are function in a system.

- Acceptance Testing

When the function and performance testing are complete, the system is convinced meets all requirements specified during the initial stages of software development. The next step is to ask the users if they concur. The user leads testing and defines the cases to be tested. The purpose of acceptance testing is to enable the users to determine if the system we built really meets their needs and expectation. Thus, acceptance test are written, conducted and evaluated by the users with assistance from the developer only when the users requires in answer to a technical requires.

- Installation Testing

The final round of testing involves installing the system at user sites. If acceptance testing has been performed on-site, the installation testing may not be needed.

However, if acceptance-testing conditions were not the same as actual site conditions, additional testing is necessary. To begin installation testing, we configure the system to the user environments. Installation tests require us to work with the user to determine what tests are needed on-site. Regression test may be administrated to verify that the system has been installed properly and works “in the field” as it did when tested previously. The best cases assure the user that the system is complete and that all necessary files and devices are present. In the ITS, the tests focus on two issues:

- i) Completeness of the installed system
- ii) Verifications of any functional or non-functional characteristics that may be effected by site conditions.

Chapter 7: System Evaluation and Conclusion

7.1 Introduction

This chapter will discuss the status development of process on the problems that had encountered and solutions. Strengths and weaknesses have the system, as well as

future improvement of the system. At the end of the project paper is also given to help concluding the report.

7.2 Problem Encountered and

Solved problem is the process of throughout the whole period of the

multimedia development project. The problems encountered are categorized based on

phase and described as follows. The problem encountered in the development phase

7.2.1 During Phase

7.2.1.1 Choosing the development technology. Choosing technology with one programming with

multimedia development project. The problem encountered is choosing technology. There

are many software and hardware that can be used in multimedia development. The

development of multimedia development project. The problem encountered is choosing

technology with one programming with multimedia development project. The

development of multimedia development project. The problem encountered is choosing

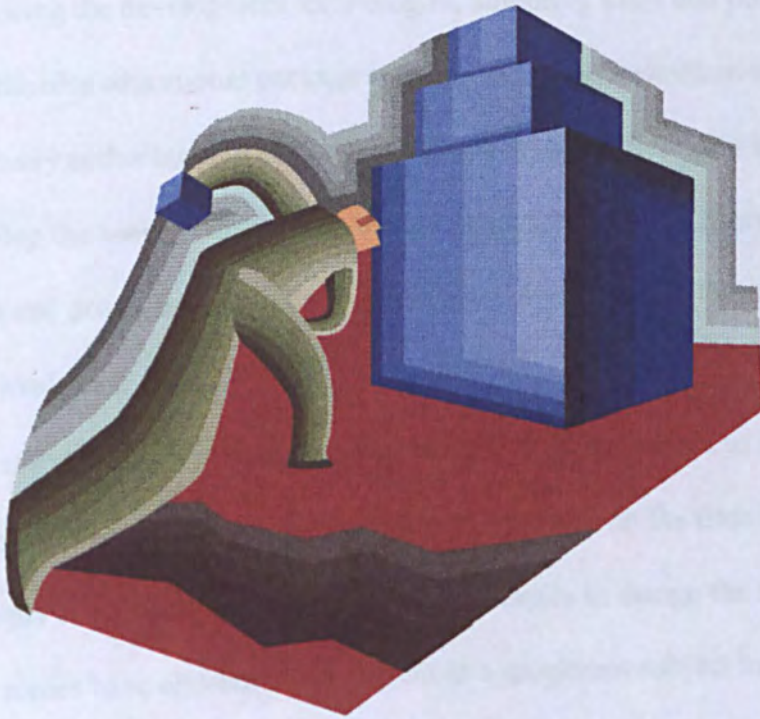
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technology with one programming with multimedia development project. The



Chapter 7: System Evaluation and Conclusion

7.1 Introduction

This chapter will discuss the entire development of process on the problems that had encountered and solutions, strengths and limitations have the system, as well as future enhancement of the this web package. The overall conclusion of the project paper is also given before concluding this report.

7.2 Problems Encountered and Solutions

Several problems were encountered throughout the development of this multimedia style of intelligent tutoring system. These problems are categorized based on phases and described in the following section.

7.2.1 During Project Studies and Analysis

- Choosing the development technologies, authoring tools and programming tools. Multimedia educational package is one of the latest technologies today. There are many authoring tools and programming tools in the market are used to develop the multimedia educational package. Choosing an appropriate authoring tools and programming tools is a critical process as all the tools has its strengths and weakness.
- Determining scope of the system to be built. It is impossible to develop a full-scale complete system for SPM Physics subject due to the time constraint given. So, only select the four topics out of seven topics to design the system. These four topics have chosen by the student as a toughness subject in the questionnaire analyzing.

7.2.2 During System Design Phase

- Time constraint. During the design, there was not enough time to study and produce the best solution of design that as stated in System Proposal part (part 1 of thesis). Mainly, this was due to inexperience and insufficient knowledge of designing a system. The best way to learn is to read as many approaches used in previous year's student report documentation.
- Transferring the system. When the half of the system is done in home then transfer the system to faculty to do the other work on that system, some of the module in the system did not function properly. So for avoid this problem happen in the future, design the system in the faculty's computer lab until the final part.

7.2.3 During Implementation Phase

- No prior experience in the chosen of authoring tools and programming tools. Due to not prior experience in Macromedia Authorware 5 and Java Script, there was more difficult in understanding of how to use those tools. The best way is to spend a lot of time and effort to learn from begins until the last about these authoring tools and the syntax of Java program. References are also made in the Internet for the learning purpose.
- Integrating the module. Have face some problems when integrated the whole system module in to one system. Some of the function, for example, voice player tool did not support or played when integrating the modules. So have to delete the problems function to avoid enhance of the system.

7.2.4 Problems with Authoring Tools

- Big file size of Authorware. Since Authorware is used to integrate the various multimedia materials, such as graphics and audio, so the size of the files increases extremely. The best way is to reduce the size of the files that are encoded the sound file in a lower sample rate and in 8-bit format. Graphics that are imported into Authorware are converted to GIF or JPEG format instead of BMP format.
- No mathematics equations support. The text function provided by the Authorware is not supported for Mathematics equations. So, for those contents that involved with mathematical equations, an OLE object (Microsoft Equation) needs to embed in the Authorware file. However, the performance of the system becomes a little bit slower.
- Leak of font support. The font style provided is too limited for Authorware. For instance, WordArt font style is not given. Since this package is implemented in multimedia way, so they style of the font is really considered important to attract the users interesting. To resolve the problem, import those required font files in image format could be considered.
- Undo action provide once only. The undo action for Authorware is restricted, that is once only. Since the Authorware allows the user to change the setting of the objects on the screen when playing, it further made worse problem. The best way to resolve this problem this problem is trying save any changes have been made before continue to next action.

7.2.5 Difficult to Debug the Java Script Language.

This script is use for to interaction function and also to calculate and store the user's score. The Java script is not run on compiling environment just like other programming. So, at first plan the source code carefully before embedded in system.

7.3 System Strengths

The following points will illustrate the strengths of the Intelligent Tutoring System (ITS).

7.3.1 User-Friendly Interface

ITS is provide a very user-friendly and consistent environment where a standard design such as buttons, menu are given, requiring non-memorizing of commands. The user-friendly interface will also shorten the process of learning hence reduce the time used on learning how to use the package.

7.3.2 Provide Animation Images, Graphics and Voice Narration Compare with Reference Book

Since this web package is in multimedia approach, there are animation images, graphics and also voice narration that explain the solution of the some Physics questions. Most of the pages are prepared completely with those multimedia materials. The purpose is to attract the user intention. When compare with the Physics reference book, this package have more times advantages.

7.3.3 Fulfill the Four main Syllabus (User Requirement)

The four main topics out of seven topics in Physics is fulfilling in this web package as the meet of the user requirement.

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7.3.4 The System is Tutoring in Intelligently Method

The intelligently methods we can discuss here are, the first one is using a voice narration to guide the user or student regarding on how to solve the Physics problems and also use for how to analyzing the Physic experiment work. On the other hand, the system also will evaluate the student which part of the Physics (calculation, concept, analyzing experiment and memorizing formulas) part are good or worst, so the student will have chance to learn better in that particular chapter. The system will set the time for the examination so that the student will require accomplishing all the questions within a given time if not they will fail the exam.

7.4 System Limitation

Despite some of the system strengths mentioned previously, there are limitations that which cannot be researched and developed due to time constraint. There are a few limitations of the system as listed below.

7.4.1 Uploading Issue

The ITS system finally cannot be uploaded into the Internet server because of the file of the system is very huge. (The actual file size is 30 MB then reduce to 14 MB). Free web hosting, like Geocities, is not allowed to store this file in their server and many web hosting company are rented very expensive to offer on their web server. This is main drawback of the system.

7.4.2 Interactive Example Not Enough

It is fairly not enough that this web package consists only a few of interactive example. Using Java Script only creates those examples. This will limit the user interact with this system.

7.4.3 Not Enough Graphics

Animation graphics are limited and the contents are far more than the animation graphics. This is because not all the content can be made into animations manner.

7.5 System Enhancement

From those limitations listed above, the system could be further enhanced in the following way:

- The notes should be read out by the system while the user is reading the notes. This is because it will become more understanding the notes.
- More interactive samples should be provided.
- The notes should be reduced and but the animations image and graphics should be added to construct a multimedia learning package become more complete.
- The animation graphics could be further improved with the insertion of several of ActiveX control such as Java applets.
- A database should be made and used to store the various data or the questions and the answers where the user could be tested on a random basis. In another words, the user could try on different questions each time they do the tutorial.
- Using a Flash package to do a graphical web page on learning purpose and try to purchase the web server so everybody can access it freely.
- Use a video file for enhancing the system in fascinating way.

7.6 Budgeting for Designing The ITS

No.	Item	Cost (RM)
1	Citeon CD Read-Writeable 40x10x32	280.00
2	Authorware Installation	10.00
3	Proposal Report (2 Items)	60.00
4	Documentation Report (2 items)	100.00
5	Hard-Cover Documentation Report	65.00
6	Micro-Phone	16.00
7	CD-R and CDR-W	30.00
	Total	561.00

Table 7.1 The Total of Budgeting for Designing the System

7.7 Conclusion

Intelligent Tutoring System (ITS) has been successfully in attaining its objective of develops a high quality courseware for the user or student who will sit for the SPM Physics. ITS found to be a user-friendly, easily understood and effectiveness that will make the Physics learning process more attractive and efficient.

However, some minor limitations still exist in the application. For example, currently the implementation of ITS is only limits to a single computer. In the future, the scope of implementation of this system will be extended to include multiple users simultaneously. All this limitation will be enhance to make the ITS learning tool become more powerful and useful tools.

Building and Internet based application software is a challenging task. A lot of research, time and effort have been taken in making this project successful. But, same time a lot of valuable knowledge are gained throughout the development of this project, which include the whole development process in building a system with the Internet-based programming and the using of the authoring techniques and it concepts.

Throughout this project, a lot of experiences have been gained, new knowledge has been acquired and more importantly, there has been an improvement in the project management. Having an up-to-date knowledge and information has become an important in keeping up with the fast and ever changing fields in the Information Technology edge. Finally this project enables the implementation of the software engineering approach to be implied in the development of the project.

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APPENDIX A

USER

MANUAL



A.2 Use SPM Physics Intelligent Tutoring System

Start Using the Learning Web Package

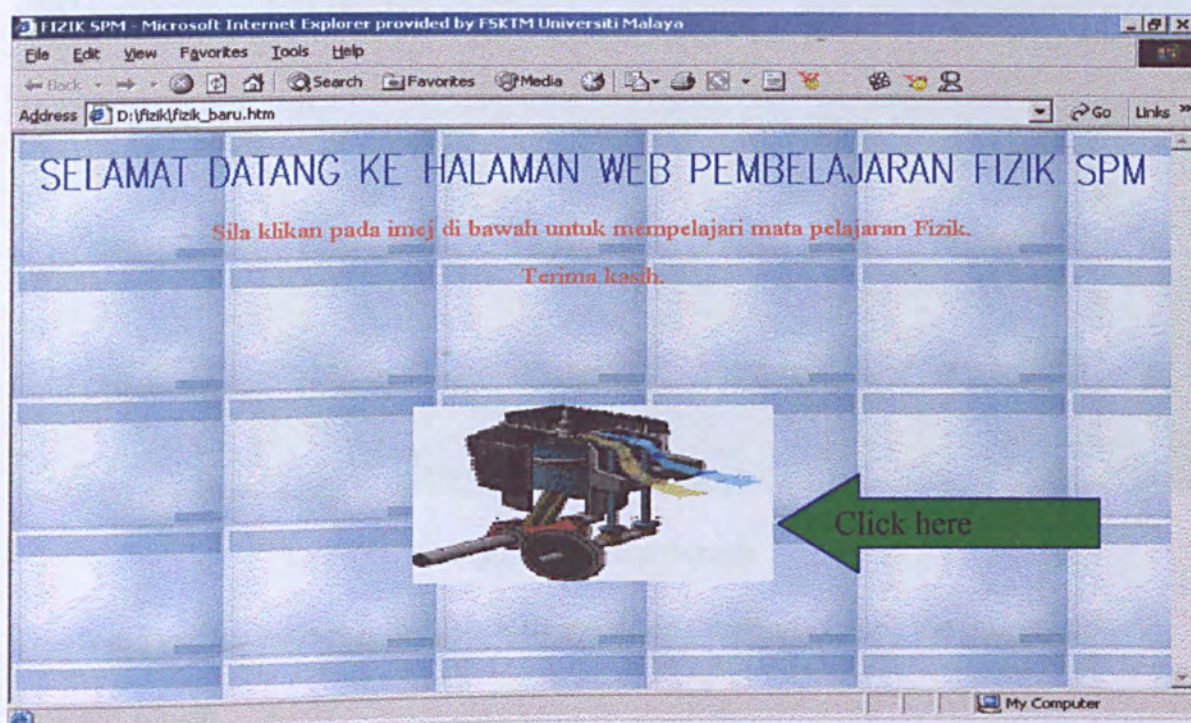


Figure A.1 Web screen

This is the web screen that would display when the user or student will begin to use this system. They need to click on the image that has been shown on the figure above.

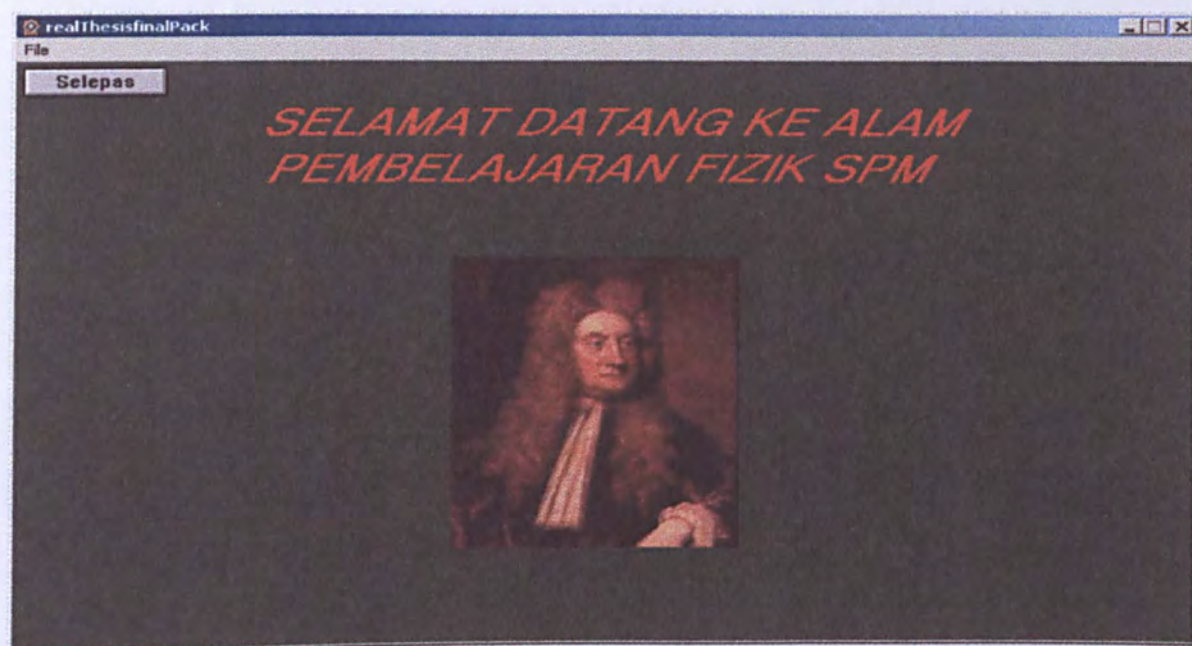


Figure A.2 First Screen

This is the main screen that the user will see when they had clicked the image in the previous screen.

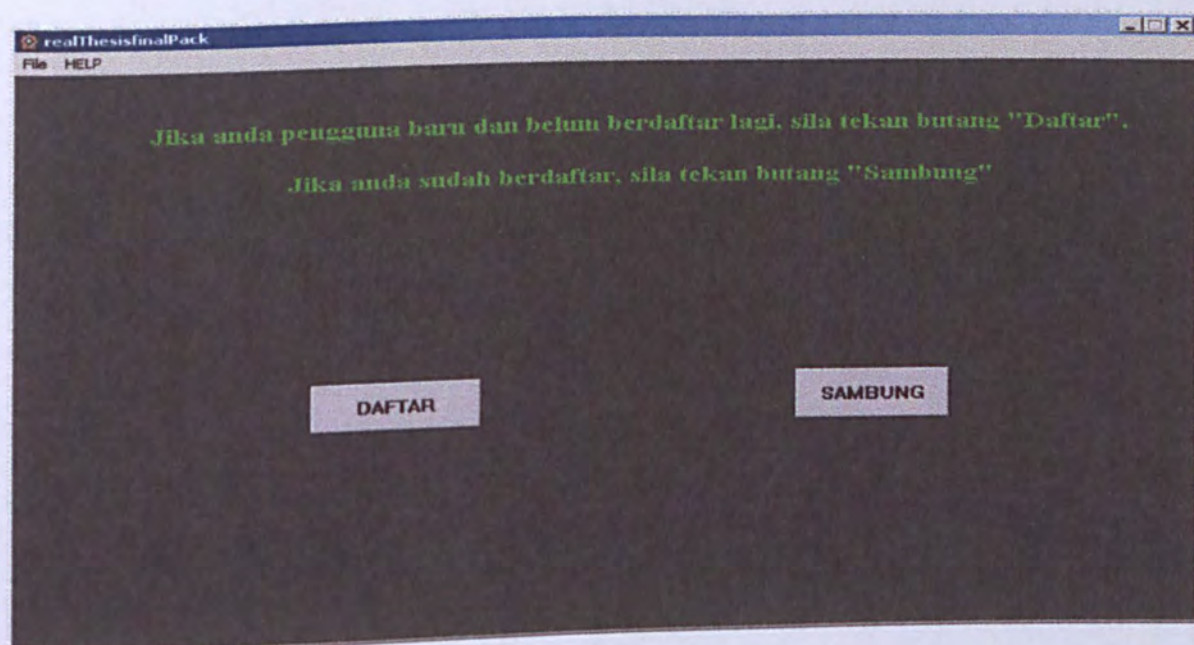


Figure A.3 Second screen.

This screen is about user's registration and if the user is first time register in this learning package, they should click in the "DAFTAR" button else if they have registered before and again to use this package, they are should click on "SAMBUNG" button.

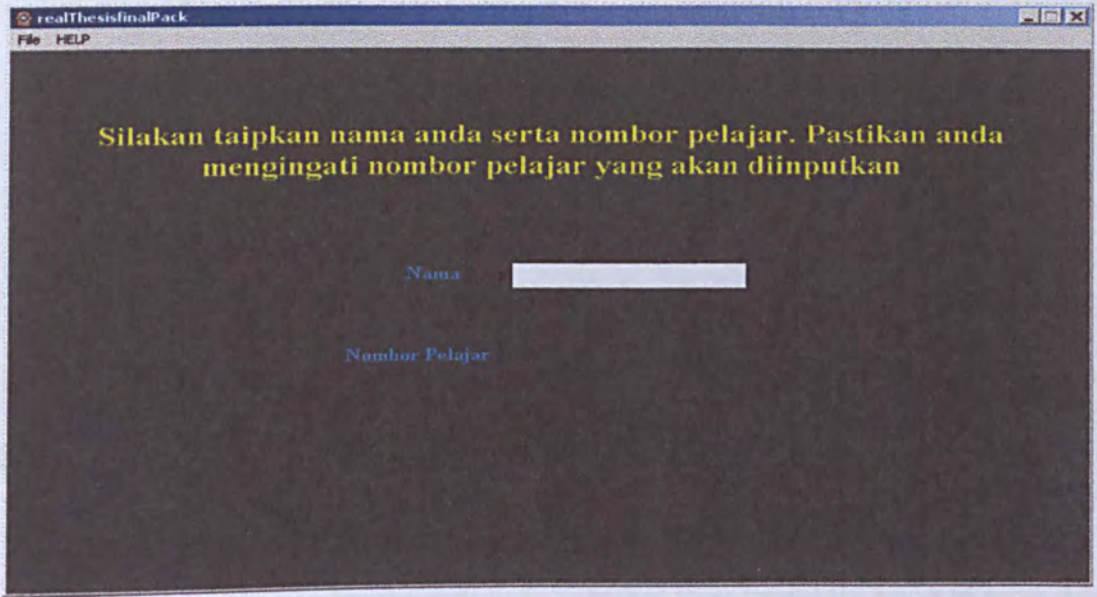
The image shows a screenshot of a software window titled "realThesisfinalPack". The window has a menu bar with "File" and "HELP". The main content area has a dark background with yellow text that reads: "Silakan taipkan nama anda serta nombor pelajar. Pastikan anda mengingati nombor pelajar yang akan diinputkan". Below this text, there are two labels: "Nama" and "Nombor Pelajar". The "Nama" label is positioned above a white rectangular text input field. The "Nombor Pelajar" label is positioned below the "Nama" label and its corresponding input field, which is not fully visible in the screenshot.

Figure A.4 Third screen

This screen is about the system will require the user's username (nama) and student number (nombor pelajar). Just enter the relevant information in the text entry space then click "Enter" in the keyboard.

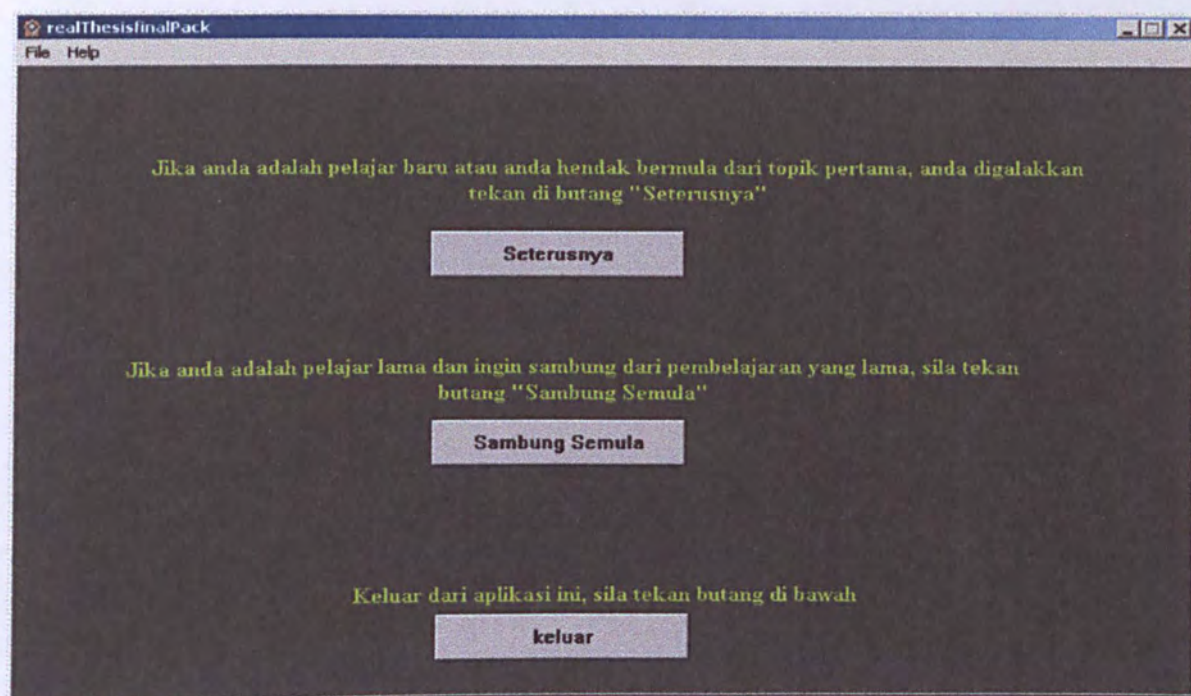


Figure A.5 Fourth screen

The “Seterusnya” button is for the first time user that they straightly bring to main menu. The “Sambung Semula” button is for the old user, that the system will bring them in the screen where they had quit previously. The “Keluar” button is for quit the learning system.

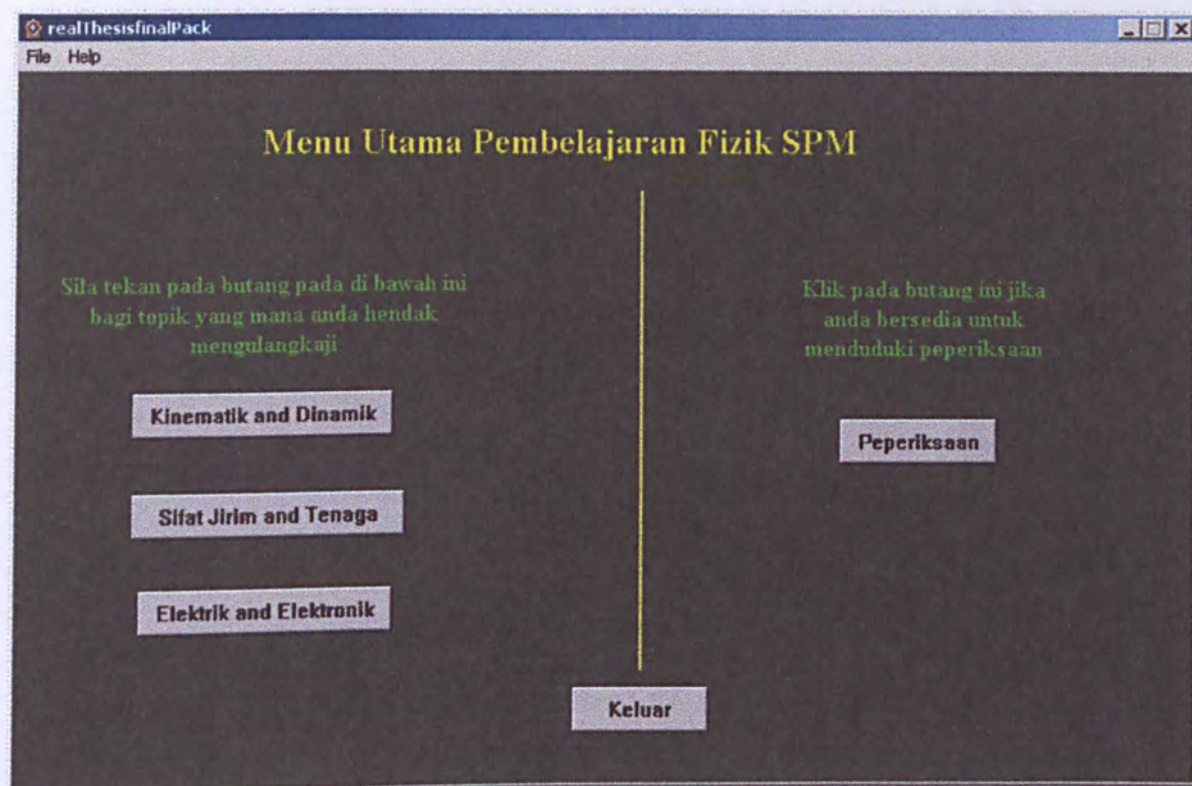


Figure A.6 Main screen

This is the main screen of the system. So the user will choose the topic they want to learn and also after they learn every topic, they require clicking “Peperiksaan” button for sit for the examination.



Figure A.7 Topic main menu

This screen shown that the particular topic of main menu. Here have all six main buttons. The “NOTA” button is for learning purpose. The “RUMUS” is for referring the list of formula in SPM Physics. The “LATIHAN RINGKAS” button is for evaluating the student understanding of Physics concept, memorizing formulas, analyzing experiment work and calculating the Physics problem. The “EKSPERIMEN” button is for to do an experiment work. The “TUTORIAL” button is for evaluating the user on understanding of that particular topic. The “TOPIK LAIN” is go to main menu.

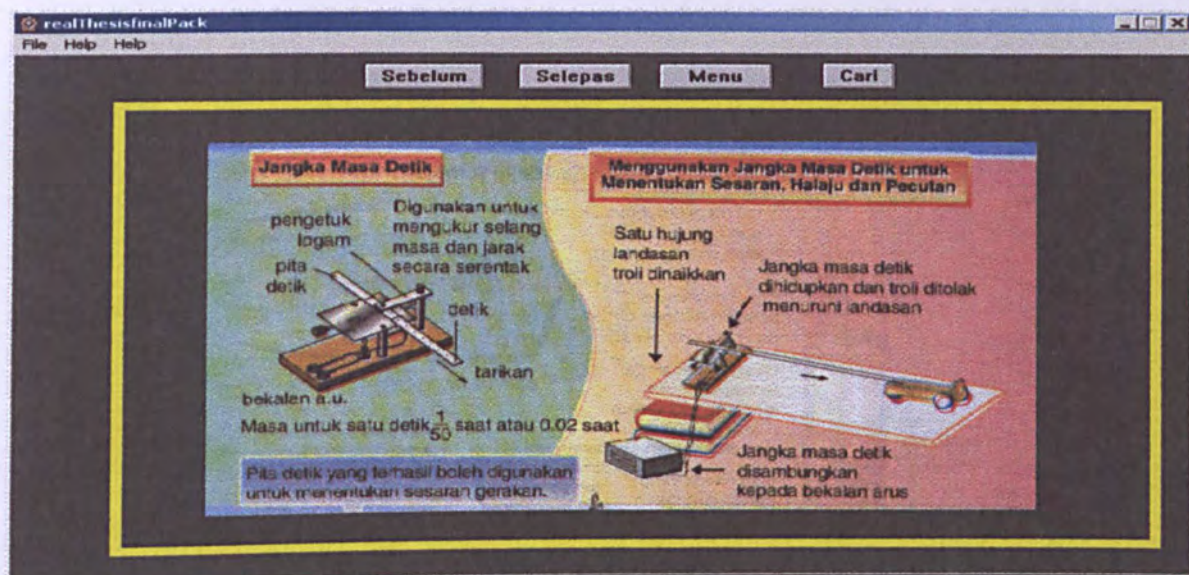


Figure A.8 Learning screen

This is the learning screen. The top of the screen in a navigation button that user can go to next or previous of the screen and click “Cari” is to go to the screen that contain the term of Physics that typed by the user. For example when the user types the term “daya” (force), the system will bring the user to that screen.

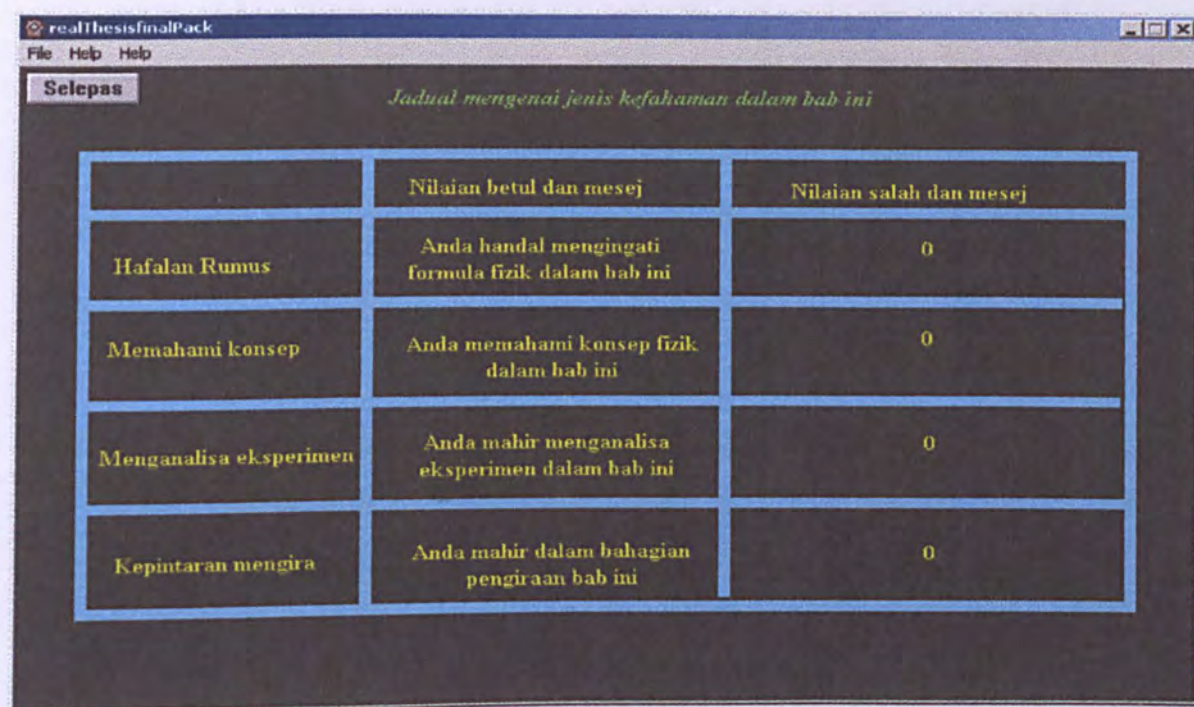


Figure A.9 Exercise screen

This screen is shown that the final result of exercise that evaluate the four item of Physics user understanding. The system will advise them if they fail to answer the question and otherwise if they success to answer that question.

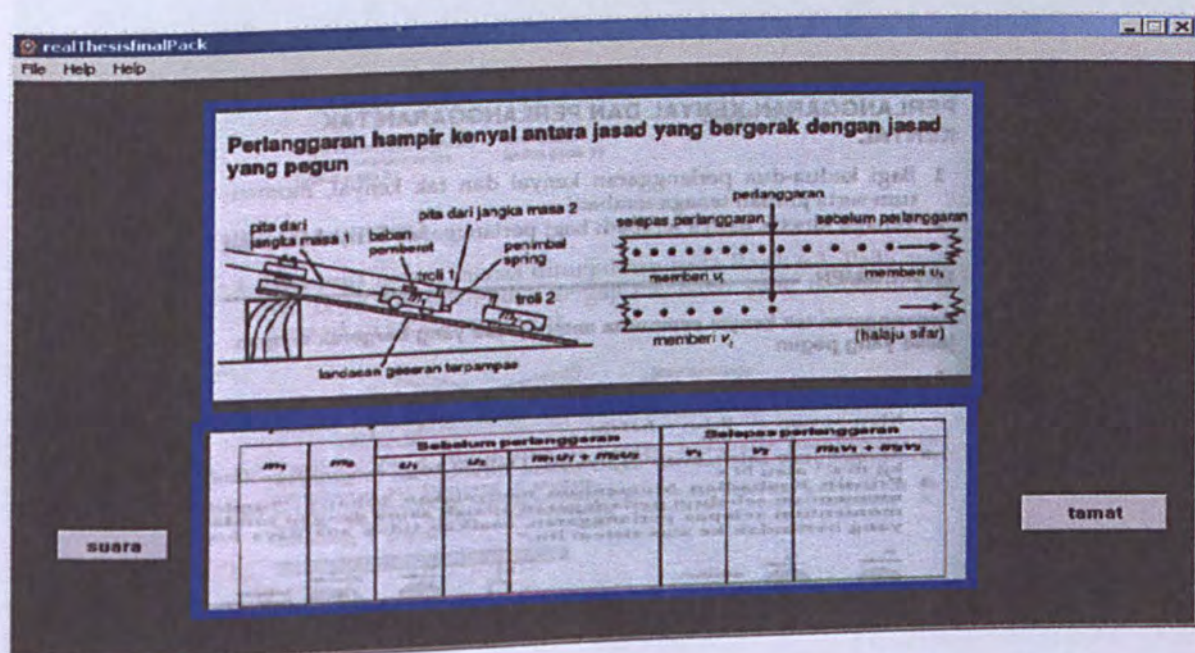


Figure A.10 Experiment screen

This screen is about the analyzing of experiment work. Along with this diagram, the user is required to click “suara” button to hear the voice-based instruction on how to the experiment work. After finished analyzing, click on “tamat” button to go to main menu topic.

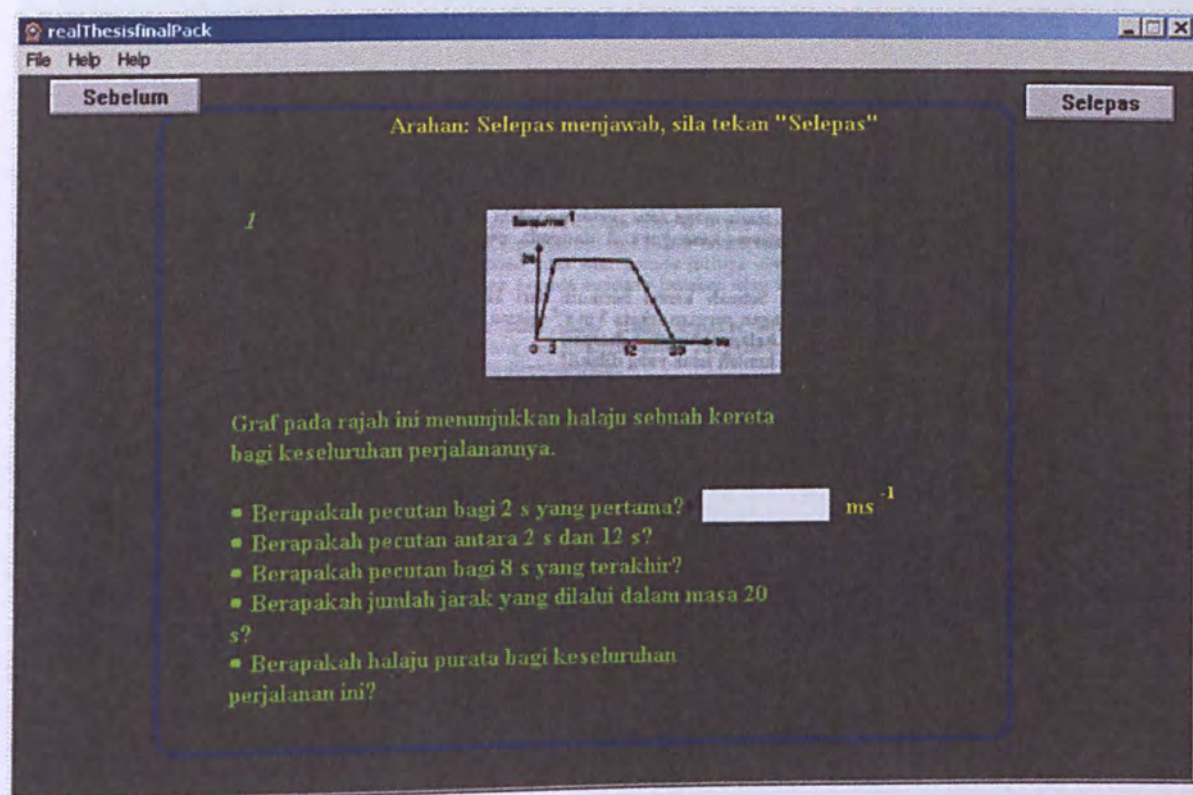


Figure A.11 Tutorial screen

This screen is showing one of the tutorial questions. The user will answer the following question by typing in the entry text box. Press “Enter” every time typing the answer and click “Selepas” to go to next question.

realThesisfinalPack

File Help Help

Graf pada rajah ini menunjukkan halaju sebuah kereta bagi keseluruhan perjalanannya

- Berapakah pecutan bagi 2 s yang pertama?
- Berapakah pecutan antara 2 s dan 12 s?
- Berapakah pecutan bagi 8 s yang terakhir?
- Berapakah jumlah jarak yang dilalui dalam masa 20 s?
- Berapakah halaju purata bagi keseluruhan perjalanan ini?

penyelesaian

a) Pecutan = $\frac{24 - 0}{2} = 12 \text{ m s}^{-2}$

b) Pecutan = 0 m s^{-2}

c) Pecutan = $\frac{0 - 24}{8} = -3 \text{ m s}^{-2}$

d) Jumlah jarak yang dilalui dalam masa 20 s
 $= \frac{1}{2} (10 + 20) \times 24 = 360 \text{ m}$

e) Halaju purata = $\frac{360}{20} = 18 \text{ m s}^{-1}$

suara

selepas

Figure A.12 Display answer for tutorial

This screen shows that the answer for the question in tutorial part. The answer is given in the pink color box and when the user click “suara”, the voice-based instruction will explain how and what the suitable steps to solve that Physics problem. Click “selepas” to go to next screen.

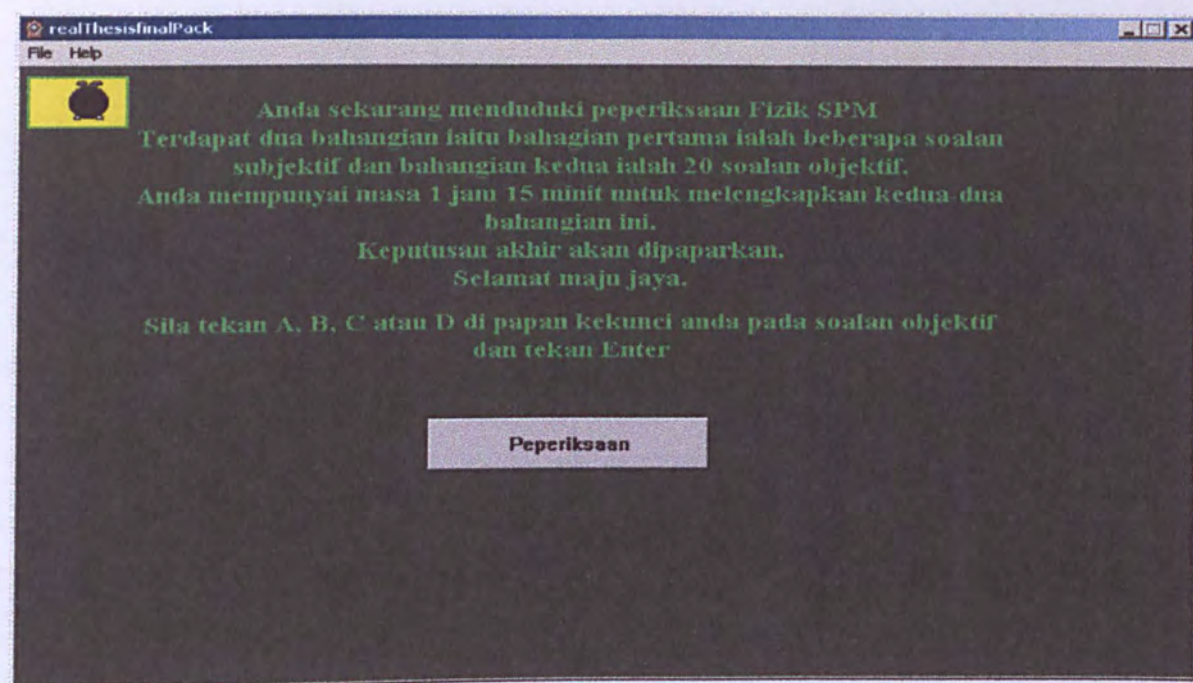


Figure A.13 Examination screen

This screen shows about the rules of examination and the user must read it before continue to do the exam question. The left-up end corner is an animation time that will remind the user about the reminding time to accomplish the examination. Just click "Peperiksaan" button to precede the exam.

APPENDIX B

QUESTIONNAIRE



Senarai soalan yang digunakan untuk mengkaji pelajar dengan mata pelajaran Fizik

Nama : _____

Umur : _____

Jantina : _____

Nama Sekolah : _____

Kelas : _____

1) Adakah anda pernah menggunakan komputer ?

☐

Ya

☐

Tidak

2) Jika ya, apakah tujuan utama anda untuk menggunakan komputer ?

☐

Permainan Video

☐

Chatting

☐

Pelajaran

☐

Kegunaan Peribadi

Nyatakan lain-lain _____

3) Adakah anda pernah mendengar tentang pendidikan berelektronik (e-education) ?

☐

Ya

☐

Tidak

4) Apa mata-pelajaran yang anda paling digemari ?

Sila nyatakan _____

5) Apakah pendapat anda tentang mata-pelajaran Fizik ?

☐

Mudah difahami

☐

Sederhana

☐

Sukar difahami

☐

Tidak berminat

6) Semasa guru anda sedang mengajar mata-pelajaran Fizik, apakah tahap kefahaman dalam mata-pelajaran tersebut ?

☐

Mudah difahami

☐

Sederhana

☐

Sukar difahami

☐

Tidak memahami

7) Apabila anda mempunyai sebarang kemusykilan semasa mengulang kaji pelajaran Fizik, adakah anda berjumpa dengan guru ?

☐

Selalu

☐

Kadang-kadang

☐

Jarang

☐

Tidak pernah

8) Apakah keputusan peperiksaan Fizik anda yang lalu ?

☐

Cemerlang

☐

Baik

☐

Memuaskan

☐

Gagal

9) Apakah jangkaan prestasi anda pada peperiksaan SPM/ STPM bagi Fizik yang akan datang ?

☐

80 – 100 markah

☐

60 - 79 markah

☐

40 – 59 markah

☐

< 40 markah (gagal)

10) Nyatakan tahap bentuk soalan yang mudah untuk dijawab semasa peperiksaan atau membuat kerja sekolah dalam mata pelajaran Fizik.

(Kategori : 1 - Sangat susah

2 – Sederhana/Memuaskan

3 – Mudah

4 – Sangat senang)

☐

Benar/Palsu

☐

Aneka-pilihan

☐

Berstruktur

☐

Esei

11) Apakah tahap bentuk soalan yang sukar untuk dijawab semasa peperiksaan atau membuat kerja sekolah dalam mata pelajaran Fizik.

(Kategori : 1 - Sangat susah

2 – Sederhana/Memuaskan

3 – Mudah

4 – Sangat senang)

☐

Benar/Palsu

☐

Aneka-pilihan

☐

Berstruktur

☐

Esei

12) Berapa lamakah anda mengambil untuk mengulang-kaji mata pelajaran Fizik dalam masa seminggu ?

☐

< 1 jam

☐

1 – 10 jam

☐

> 10 jam

☐

Tidak pernah

13) Adakah anda pernah melayani Internet untuk tujuan mempelajari Fizik ? (Jika tidak, sila jawab soalan ke-15)

☐

Ya

☐

Tidak

Jika ya, sila nyatakan alamat webnya : _____

14) Adakah alamat web ini mengandungi

☐

Nota-nota Fizik

☐

Soalan struktur/Isi tempat kosong

☐

Aneka-pilihan

☐

Makmal

15) Apakah pendapat anda, mengenai pembelajaran Fizik secara 'online' di Internet ?

☐

Sungguh berkesan

☐

Senang memahami

☐

Memuaskan

☐

Membosankan

16) Sila susunkan topik-topik Fizik dengan tahap kesukaran anda?

(Kategori : 1 - Sangat susah

2 – Sederhana/Memuaskan

3 – Mudah

4 – Sangat senang)

☐

Mekanik

☐

Kelektro-magnetan

☐

Fizik Atom

☐

Gelombang

17) Adakah anda bertambah minat terhadap mata-pelajaran Fizik sekiranya anda belajar secara 'online' di Internet ?

☐

Ya

☐

Tidak

18) Jika ya, apakah anda lebih mengharapkan untuk kandungan bagi mempelajari Fizik ini ?

☐

Nota

☐

Contoh pengiraan

☐

Tutorial

Lain-lain: _____

19) Apakah ciri-ciri tambahan sesuai yang patut diselitkan untuk membantu dalam membelajari Fizik secara 'online' ?

☐

Audio/Bunyi

☐

Animasi

☐

Interaksi dengan pengguna

☐

Grafik

Sila nyatakan yang lain-lain _____

20) Adakah anda pasti memperoleh markah yang tinggi untuk mata pelajaran Fizik setelah menggunakan kaedah pelajaran secara 'online' ?

☐

Pasti

☐

Sederhana

☐

Kurang pasti

☐

Tidak pasti

Terima kasih kerana sudi meluangkan masa untuk menjawab senerai soalan ini.

Nama guru yang ditemudugakan : _____

Nama sekolah : _____

- 1) Bagaimanakah mutu pembelajaran oleh pelajar-pelajar di sekolah ini?
- 2) Adakah pelajar-pelajar menggunakan komputer di sekolah semasa mengulang-kaji sesuatu pelajaran
- 3) Bagaimanakah prestasi bagi mata-pelajaran Fizik bagi SPM/STPM bagi tahun-tahun yang lepas ?
- 4) Adakah prestasi bagi Fizik ini semakin meningkat setiap tahun ?
- 5) Adakah tuan menggunakan sebarang peralatan Teknologi Maklumat (IT) untuk mengajar Fizik ? Apakah peralatan tersebut ?
- 6) Apakah pendapat tuan, jika pelajar menggunakan cara pembelajaran secara 'online' di Internet bagi mata-pelajaran Fizik ?
- 7) Apakah kebaikan dan keburukan yang diperolehi dengan kaedah pembelajaran jenis ini ?
- 8) Bentuk soalan apakah yang sukar untuk dijawab oleh pelajar ?
- 9) Jikalau pelajar menggunakan pembelajaran secara 'online' bagi Fizik, apakah kandungan utama yang perlu diselitkan supaya mereka lebih mahir dalam mata-pelajaran tersebut ?
- 10) Sejauh manakah para pelajar terdedah ke alam Teknologi Maklumat (IT) ?
- 11) Apakah topik-topik utama Fizik yang harus diberi penekanan kepada pelajar bagi menghadapi peperiksaan SPM/STPM ?
- 12) Apakah pendapat tuan jika pembelajaran secara 'online' ini meliputi penggunaan gambar-gambar animasi/grafik, audio, ramah-pengguna dan lain-lain ?
- 13) Secara kesimpulannya, sejauh manakah keadah pembelajaran ini akan menolong para pelajar untuk lulus dalam mata-pelajaran Fizik ?
- 14) Pada masa yang akan datang, adakah kaedah pembelajaran jenis ini sesuai digunakan untuk mengulang-kaji mata-pelajaran Fizik berbanding dengan pelajar-pelajar yang belajar di pusat bimbingan atau menelaah dengan buku-buku rujukan?

APPENDIX C

HAND OUT IN PRESENTATION



Presentation on Interaction Tutoring System

This system is purposely for the SPM students who sit for the paper Physics. The system has various elements, for example colorful text; graphic, sound and more important is interactively communication between student or user with computer. There have many modules that included in this system.

Learning module

The students will learn about Physics concepts in a little note regarding on each chapter the module is present.

Tutorial module

The student will be required to do a tutorial for each chapter for evaluating their understanding on that chapter. After that, the system will display the result and give advice if they obtain a low mark.

Exercise module

The student will be asked to do four types of questions to evaluate their understanding in Physics concept, calculation, formula and experiment theory.

Experiment module

The students will be guided and narrated by system (using voice), how to implement the experiment work and the analysis of that experiment.

Formula module

Provides the Physics formula for reference.

Examination module

The students will require sitting for the exam. The system provide one hour and 15 minutes to them to accomplish all the questions.

Thank you.